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SIR THOMAS MARYON WILSON BART

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A GENERAL

DICTIONARY

OF

ARTS AND SCIENCES:

OR,

A Complete Syſtem of Literature.

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Gardener to the Right Hon. the Earl of Chesterfield.

And the Other Branches of Literature,

By a SOCIETY of GENTLEMEN, who are Lovers and Encouragers of Science.

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TO THE PUBLIC.

AS there are already ſeveral Dictionaries of Arts and Sciences extant, it may perhaps ſeem unneceſſary to trouble the World with another. But we flatter ourſelves that this Objection will vaniſh when it is remembered that, notwithſtanding what has been already performed, there is ſtill ample room for preſenting the Public with a Work of this kind far ſuperior to any Dictionary yet known in the Republic of Letters.

If this be granted, the only Queſtion remaining will be, Whether the Authors are equal to the taſk, and capable of putting into the Hands of their Readers a Syſtem of Literature, in which the various Branches are more fully explained, and the different Arts and Sciences enriched with more Diſcoveries, and more important Obſervations, than thoſe of any other Performance of the ſame Kind?

In order to anſwer this Queſtion, we would beg Leave to obſerve, that ſeveral of the Gentlemen concerned in this Work are already known in the Republic of Letters; and that their Labours have more than once obtained the Approbation of proper Judges. And as they are determined to exert their utmoſt Abilities on this Occaſion, they have ſome Reaſon to flatter themſelves that their Readers will not be diſappointed.

They would alſo humbly hope, that it will be unneceſſary to obſerve any thing farther with regard to the Articles relating to Poetry, Criticiſm, Grammar, and Theology, than that they will all be executed by the Hand of the ingenious Mr. Scott, Fellow of Trinity-College, Cambridge.

Aſtronomy, in all Works of this nature, is, perhaps, more defective than any other Science. Nor will this appear ſurprizing, when it is remembered, that the Perſons who have hitherto undertaken the Aſtronomical Articles have not been reſident at the Royal Obſervatory at Greenwich, and conſequently could not have recourſe to thoſe valuable Inſtruments and Machines neceſſary for elucidating that important Branch of Science. Theſe Inſtruments and Machines have been furniſhed by the State at an immenſe Expence, and are not to be equalled in any Part of Europe. Mr. Green, who reſided many Years at the Royal Obſervatory, as Obſerver, with the late eminent Royal Aſtronomers Dr. Bradley and Mr. Bliſs, in conſequence of his Office had the chief Uſe of theſe Inſtruments, together with free Acceſs to the Writings of his Predeceſſors, whoſe Diſcoveries have done ſo much Honour to their Country; the Reader may, therefore, be aſſured that the Aſtronomical Articles will excel any hitherto publiſhed: And that among ſeveral other valuable Improvements, the twelve Plates of the Zodiac will be given, in which the Places of all the Stars to the fourth Magnitude, incluſive, will be inſerted, as ſettled from actual and accurate Obſervations.

We

We would alſo beg Leave to add, that Mr. Green was lately ſent to Barbadoes, by the Right Hon. the Lords of the Admiralty, as a proper Perſon to make Obſervations for fixing the Longitude of that Iſland, in order to determine the Merits of each Candidate for the Reward offered by Parliament for the Diſcovery of the Longitude.

Mr. Falconer, the Conductor of the Naval and Marine Department, is a Gentleman who has been trained to a Naval Life, whoſe Knowledge of the Marine is evidently diſplayed in a Poem called the Shipwreck, and whoſe Abilities, we apprehend, will be able to ſtand the Teſt of Scrutiny.

The Articles relating to Botany and Gardening have alſo been hitherto executed in a very ſuperficial Manner, being merely copied from preceding Treatiſes. But we will venture to promiſe the Reader, that what relates to theſe Particulars will be performed in a very different Manner in this Work, Mr. Meader purpoſing to enrich his Department with the lateſt Diſcoveries and Improvements in that Science, confirmed by the Practice of the moſt eminent Botaniſts and Gardeners. The Abilities of Mr. Meader are ſo well known to the Botaniſts and Gardeners of theſe Kingdoms, that the Reader may expect to meet with ample Satisfaction.

We will venture to add, that the Articles relating to the other Arts and Sciences, will be executed in the ſame maſterly Manner, and Improvements added in every Branch of Literature.

With all the Advantages above-mentioned, it is not to be doubted but the Public will, for their own ſake, as well as to reward Merit, purchaſe with Avidity a Work ſo evidently calculated for their Advantage and Emolument, and which will reflect ſo much Honour on theſe Kingdoms.

It has been the common Practice for Authors to ſuppoſe their Readers have acquired ſome degree of Knowledge in the Arts and Sciences before they venture to conſult their Dictionaries: And hence many have been diſappointed in their Hopes of attaining a competent Knowledge of the Arts and Sciences, after they have taken the Pains to peruſe aſſiduouſly ſuch voluminous Writings. We therefore propoſe to purſue a very different Method: To treat of the Arts and Sciences without ſuppoſing the Reader has previouſly attained any Knowledge of them; and to make the various Articles mutually explain and illuſtrate each other. And hence we have Reaſon to hope, that the Dictionary we now offer to the Public will ſupply the Place of a Library; aſſiſt in aſcertaining and improving Human Knowledge; and by increaſing the Number of the truly learned, real Artiſts, and judicious Admirers, diffuſe many new Advantages over our native Country. May Poſterity, on conſulting our Work ſay, Such was then the State of the Arts and Sciences in Great Britain! May ſucceeding Artiſts add to the Diſcoveries we have regiſtered: And may this Dictionary, with the Improvements of future Writers, remain a Sanctuary to preſerve Human Knowledge from the Ravages and Revolutions of diſtant Ages!

A GENERAL

DICTIONARY

OF

ARTS and SCIENCES.

A

A, The firſt letter, and firſt vowel, of the Engliſh alphabet, as well as of moſt other ancient and modern languages: the reaſon of which, according to Scaliger, is, that it is the ſimpleſt and moſt eaſy of all ſounds; and as ſuch, is firſt dictated by nature to infants. Even dumb perſons have been taught to pronounce it: for it does not depend on a due conſtruction of the mouth, tongue, or noſe; but is formed, when the lips are open, by the leaſt motion of the throat. It ſeems indeed to be the language of nature; for we make uſe of it on every ſudden and violent ſally of the mind, to expreſs our fear, ſurprize, and anguiſh; as well as on gentler occaſions, when we ſhew our love, admiration, and joy.

It is obſervable that this letter has three different ſounds in Engliſh: in the words *what*, *have*, *ſhall*, &c. it is ſhort; it is long in *hate*, *cave*, *ſtale*, &c. and at other times it is broad, as in *ſtall*, *talk*, *call*, &c. No nation pronounces this letter ſo *cloſe* as the Engliſh; which in the generality of our words has ſcarcely ſo *open* a ſound as the *E neuter* of the French.

A, has been made uſe of as a numeral letter, but not by the ancients; for it appears to have been introduced in the days of barbariſm. It ſignified 500, and by the addition of a daſh on the top, $\overline{A}$ ſtood for 5000.

A, was employed by the Romans as the firſt of the eight *nundinales literæ*, and afterwards adopted into the Julian calendar, as the firſt dominical letter.

It was alſo made uſe of in the Roman ſenate, when ſuffrages were given to reject or enact a law.

A B

Each voter was furniſhed with two ballots, on one of which was marked the letter A, and on the other U. R. The former ſtood for *anti quam volo*, or I antiquate or reject it; the latter ſignified *uti rogas*, or you have my aſſent. In the trials of criminal cauſes it denoted abſolution; whence Cicero, in his oration for Milo, calls it *litera ſalutaris*, or the ſaving letter. See VOTING.

It is alſo an abreviature, and on ancient marbles, &c. ſtands for *Auguſtus*, *Ager*, *aiunt*; when double or triple it denotes *Auguſti duo*, or *tres*. After the word *Miles*, Iſidore ſays it ſignifies young. Amongſt logicians, it denoted an univerſal affirmative propoſition: and with chymiſts, when thus written A. A. A. ſignifies an amalgama, or the proceſs of amalgamation.

A. ā, or ā ā, is uſed by phyſicians as an abbreviation of *ana*, and ſignifies an equal quantity of the ingredients immediately preceding it in the preſcription.

AAM, or HAAM, a meaſure of capacity, uſed at Amſterdam. See HAAM.

AB, according to the Jewiſh computation, was the name of the eleventh month of the civil year, and the fifth of the ſacred. The Iſraelites made uſe of two computations: the civil year, according to the epoch of the Canaanites, and Egyptians, began at the autumnal equinox. But the ſacred year, by which their faſts and feſtivals, and all other religious acts were regulated, commenced at the vernal equinox.

This month anſwers, according as the lunations happen, to the latter part of July, and the begin-

ning of Auguſt. On the firſt day of this month the Jews faſt, in memory of Aaron's death; and on the ninth, becauſe upon that day the temple of Solomon was burnt by the Chaldeans, and the ſecond temple, built after the Captivity, by the Romans. It is believed by the Jews, that thoſe who were ſent as ſpies into the land of Canaan, returned on this day to the camp, and engaged the people in rebellion. This too was the day on which, according to their traditions, the edict of Adrian was iſſued out, forbidding them any longer to continue in Judea, or even to lament the deſolation of Jeruſalem. They faſt on the eighteenth of this month, becauſe in the time of Ahaz the lamp of the ſanctuary was on that night extinguiſhed.

ABACK, in naval affairs, a ſituation of arranging the ſails of a ſhip, in which they are flatted againſt the maſts by the force of the wind, to effect a ſudden retreat or backward motion, in order to avoid ſome danger diſcovered before the ſhip in a narrow channel, &c. See BACKING *the Sails*. It is likewiſe common to ſpread ſome ſail aback in the hinder-part of a ſhip, when ſhe lies in a road, to keep her at a proper diſtance from her anchor, that ſhe may not run over it, and entangle it with ſlack cable. See CABLE.

ABACOT, a cap of ſtate, in the figure of a double crown, and worn in antient times by our Engliſh kings.

ABACTORS, in law, are thoſe who drive away, or rather ſteal whole herds of cattle, in which they are diſtinguiſhed from fures, or thieves.

The word is Latin, and derived from *abigo*, to drive away.

ABACUS, among the ancients, implied a kind of cupboard, or buffet.

The word is Latin, and derived from the Greek ἄβαξ, which ſignified the ſame thing.

ABACUS, in architecture, is the upper member of the capital of a column, and to which it ſerves as a kind of crown.

Vitruvius tells us, that the abacus was originally intended to repreſent a ſquare tile laid over a baſket. An Athenian matron happening to place a baſket, covered with a ſquare tile, on the root of an acanthus, which grew on the grave of a young Corinthian lady, the plant ſhooting up the following ſpring encompaſſed the baſket, till meeting with the tile, the leaves turned back in a kind of ſcrolls. Callimachus, an ingenious ſtatuary of Athens, was pleaſed with the beautiful novelty, and executed a capital on this plan, repreſenting the tile by the abacus, the leaves of the acanthus by the volutes or ſcrolls, and the baſket by the vaſe or body of the capital.

It ſtill retains its original form in the Tuſcan, Doric, and ancient Ionic orders; but not in thoſe of the Corinthian and Compoſite; its four ſides or faces being arched inwards, with ſome ornament, as a roſe, &c. in the middle of each arch.

Scamozi uſes the word abacus to ſignify a concave moulding in the capital of the Tuſcan pedeſtal.

ABACUS, among the ancient mathematicians, implied a ſmall table ſtrewed over with duſt, on which they drew their ſchemes and figures.

ABACUS, in arithmetic, the common multiplication table.

ABADIR, in mythology, the ſtone which Saturn ſwallowed, believing it to be his infant ſon Jupiter.

ABADDON, the name by which the king of the locuſts, mentioned by St. John in the Revelations, is called. The word is derived from *abad*, to conſume.

ABAFT, in naval affairs, further aft, or nearer the ſtern; as the barricade is ſituated abaft the main-maſt, *i. e.* further aft than, or behind the main-maſt.

ABAPTISTON, a name given by the ancients to the perforating part of the trepan. See TREPAN.

The word is formed from the Greek ἀ priv. and βαπτω, to ſink under, becauſe the inſtrument is by its conſtruction prevented from ſinking ſuddenly into the brain.

ABARTICULATION, in anatomy, the ſame with diarthroſis. See DIARTHROSIS.

ABAS, a weight uſed in the Eaſt-Indies for weighing pearls. It is equal to ſeven-eighths of the European carat.

ABASED, or ABAISSE, in heraldry, is applied to the wings of eagles, &c. when the tip or angle tends downwards; or when the wings are ſhut: the natural way of them being ſpread, with the tip pointing to the chief, or the angles.

A chevron, a pale, a bend, &c. are alſo ſaid to be abaſed, when their points terminate in, or below the center of the ſhield. And an ordinary is ſaid to be abaſed, when it is placed below its proper ſituation.

ABATEMENT, in heraldry, implies ſomething added to a coat of armour, in order to diminiſh its proper value and dignity; and indicate ſome diſhonourable action, or ſtain, in the character of the bearer.

But it is very juſtly obſerved, by the laſt editor of Guillim's heraldry, that as arms are *inſignia nobilitatis & honoris*, they cannot admit of any mark of infamy, without ceaſing to be arms, and becoming badges of diſgrace, which all would covet to lay aſide.

ABATEMENT, in law, ſignifies an intruſion, or entry on lands before the heir, by a perſon who has no right to make ſuch entry.

ABATEMENT, alſo implies the fruſtrating, or ſetting aſide a ſuit, on account of ſome fault either in the matter or manner of proceeding.

ABB, among the woollen manufacturers, implies the yarn of a weaver's warp.

ABBESS, the ſuperior of an abbey, or convent of

of nuns, over whom she presides, and is invested with the same privileges as the abbots regular. She cannot indeed perform any of the spiritual offices of the priesthood herself; but there are instances of some abbesses who have the privilege of commissioning a priest to act for them.

We read of some abbesses who had formerly a right of confessing their nuns; but they abused it so much, through a vain and immoderate curiosity, that it was found necessary to deprive them of it.

ABBEY, a monastery, or kind of catholic college, into which persons retire from the world, to spend their time in sloth and solitude. The institution of these religious houses was certainly first of all pious and useful; as they were intended for seminaries of religion, and asylums to sanctity: but like many other good things, they have been wretchedly perverted. Henry the VIIIth having appointed visitors to inspect the behaviour of the abbots and monks, found them so loose and dissolute, so prone to idleness and pride, fomenting quarrels, and spiriting up rebellions against the government, that he dissolved the order, and converted their revenues, which amounted to 2,853,000 l. per ann. into lay fees.

Abbeys differ only from priories, as those are under the government of an abbot, and these of a prior.

ABBOT, or ABBAT, the superior of an abbey or monastery of monks, erected into a prelacy. The word appears to be derived from the Hebrew *ab*, which signifies father: from this came the Syriac or Chaldæan *abba*, which we find made use of by St. Mark, and St. Paul in Romans viii. 15. where he says, "we have received the spirit of "adoption, whereby we cry *abba*, i. e. father."

The monasteries, in the earlier ages of Christianity, were built in sequestered and desart places, fitted for study and contemplation. They were governed by men as remarkable for their plainness and simplicity as for their learning and religion; who contented themselves with the management of their own houses, without interfering at all in ecclesiastical affairs. They were subject to the bishops; and if they were too remote to attend the public worship at the parish church, a priest was sent to them, to administer the sacraments. But they did not always continue thus humble and unambitious: for being men of letters and science, they were called from their solitary abodes, to oppose the rising heresies of the times; and were first fixed in the suburbs, and then in the cities themselves. From this period they began to degenerate: they shook off by degrees their dependency on the bishops, were goaded with the lust of power, and affected titles of honour and distinction. Hence arose different orders and species of abbots; some were called *mitred abbots*, from the privilege of wearing the mitre, and had a full episcopal authority within their several precincts; others were termed *crosiered abbots*, from bearing the crosier, or pastoral staff: some again were stiled *œcumenical* (i. e. universal) *abbots*, in imitation of the patriarchs of Constantinople, such as John the Faster, and Cyril his successor; others were called *cardinal abbots*, either from being superior to all others, or the principals of monasteries, which came to be separated.

Abbots are at present chiefly distinguished into regular and commendatory: the former are real monks, who have taken the vow, and wear the habit of the order: the latter are seculars; though they have undergone the tonsure, and are obliged by their bulls to take orders, when they come of age. Tho' they are said to hold their abbeys only in commendam, which means but for a few years, yet they continue, and reap the fruits of them for life, as the regular abbots do.

Before Henry the VIII's time, there were in England elective and presentative abbots; some mitred, and others not. The mitred were invested with episcopal authority themselves, but the others were subject to the diocesan in spiritual matters. The mitred abbots were lords of parliament, as were some of the priors, who were called lords priors. Sir Edward Coke says there were twenty-seven parliamentary abbots, and two priors.

The ceremony whereby abbots are created, is called benediction, and consists in cloathing him with the cowl, giving him the pastoral staff, and the shoes, called pedules.

ABBREVIATION, or ABBREVIATURE, a contraction of a word or passage, by dropping some of the letters, or by substituting certain marks or characters in their place.

The word is Latin, *abbreviatio*, and derived from *brevis*, short.

Lawyers, physicians, &c. use a great number of abbreviations, a list of the principal of which, in the several arts and faculties, the reader will find under the article CHARACTER.

ABBREVIATORS, officers in the Roman chancery, whose business is to draw the pope's briefs, and reduce petitions granted by that pontiff into form.

ABBREVOIRS, in masonry, imply certain small channels or trenches, made with a proper tool, in the joints and beds of stones, in order to receive the mortar or cement, and bind them the firmer together.

ABBUTTALS. See ABUTTALS.

ABCEDARY, or ABCEDARIAN, an epithet applied to such compositions, whose parts are composed in the order of the letters of the alphabet. The ancient Hebrew writers often composed their writings in this manner; and hence we have abcedarian psalms, hymns, lamentations, &c.

ABDEST, among the followers of Mahomet,

implies the lotion or washing constantly used before prayer, entering the mosque, or reading the alcoran.

ABDICATION, the act whereby a magistrate, or person in some office, renounces or gives up his authority, before the legal time of his service is expired.

It differs from resignation, in being done purely and simply; whereas resignation is done in favour of a third person.

ABDICATION, among civilians, signifies a father's discarding his son, and expelling him from the family.

ABDOMEN, in anatomy, a cavity of the human body, containing many of its principal parts, and often called the lower venter, or belly, extending from the thorax to the bottom of the pelvis.

Anatomists divide the abdomen into three anterior regions, and one posterior; the anterior are the epigastric or upper, the umbilical or middle, and the hypogastric or lower region; and the posterior is called regio lumbaris.

Each of these regions is likewise divided into three parts, two lateral and a middle one. Thus the two lateral parts of the epigastric region are called the right and left hypochondrium: the middle part of the umbilical region is termed umbilicus, and its lateral parts lumbi, or loins: and in the hypogastric region, the middle part is called pubes, and its two lateral parts the inguinæ, or groins.

The cavity of the abdomen contains the stomach, the alimentary duct, the mesentery duct, mesocolon, omentum, liver, gall-bladder, spleen, pancreas, mesenteric glands, the lacteal vessels, receptaculum chyli, kidneys, renal glands, ureters, bladder, and the internal parts of generation in both sexes. See each under its proper article.

The abdomen forms a kind of oblong convexity, resembling an oval vault, separated from the cavity of the thorax by the diaphragm. It is lined on the inside by a strong but soft membrane called peritonæum, which surrounds and contains all the viscera. On the outside it is guarded by the muscles called obliqui ascendantes and descendentes, together with the rectus transversalis and pyramidales.

ABDUCTION, in logic, a form of reasoning, called by the Greeks *apagoge*, in which the greater extreme is evidently contained in the medium, but the medium not so evidently in the lesser extreme. The following syllogism is of this kind:

All whom God absolves are free from sin;
But God absolves all who are in Christ:
Therefore all that are in Christ are free from sin.

Here the major is evident; but the minor, or assumption, not so, unless proved by some other proposition: as, God received satisfaction for sin by the suffering of Christ.

ABDUCTION, in surgery, a kind of fracture, where the bone being entirely broken near a joint, the two stumps recede considerably from each other. See FRACTURE.

ABDUCTOR, or ABDUCENT, an epithet applied to several muscles of the human body, on account of their office, which is that of pulling back, or opening the parts to which they are fixed.

ABDUCTOR *auricularis*, or of the little-finger, arises from the annular ligament, and the third and fourth bones of the carpus in the second rank, and is inserted into the first bone of the little finger. It serves to draw that finger from the rest, and also to bend it a little.—In some subjects it appears divided into two or three muscles, consisting of so many different series of fibres.

ABDUCTOR *indicis*, or of the fore-finger, arises from the inside of the bone of the thumb, and is inserted into the first bone of the fore-finger, which it draws from the rest towards the thumb.

ABDUCTOR *minimi digiti manus*. The same with abductor auricularis. See ABDUCTOR *auricularis*.

ABDUCTOR *minimi digiti pedis*, or of the little-toe, arises from the outside of the os calcis, near the exterior bone of the metatarsus, and is inserted laterally into the outside of the second bone of that toe, which it pulls from the rest.

ABDUCTOR *oculi*, or of the eye, is one of the four recti, or of the straight muscles, arising from the bottom of the orbit, and spread over the first proper tunic; serving to draw the eye towards the outer canthus.

ABDUCTOR *pollicis*, called also *thenar*, arises from the annular ligament, and first bone of the carpus; from whence passing to the thumb, it forms that fleshy body called mons lunæ: it draws the thumb from the fingers.

ABDUCTOR *pollicis pedis*, or of the great-toe, arises from the inside of the os calcis, and the greater os cuneiforme; and is inserted into the outside of the exterior os sesamoideum pollicis: it draws the great-toe from the rest.

ABELE, in botany. See the article POPLAR-TREE.

ABELIANS, ABELONIANS, or ABELOITES, a sect of heretics during the reign of Arcadius, near Hippo in Africa, whose distinguishing tenet was to marry, and yet live in a professed abstinence.

The learned have taken great pains to ascertain the reason of this denomination; but after all their labours, it appears that they took their name from Abel, for no other reason than because, like that patriarch, they had no issue.

ABERRATION, in astronomy, an apparent motion of the fixed stars, first observed by Dr. Bradley, royal professor of astronomy.

That able astronomer, in the year 1725, together with M. Molineux, began a series of new observations,

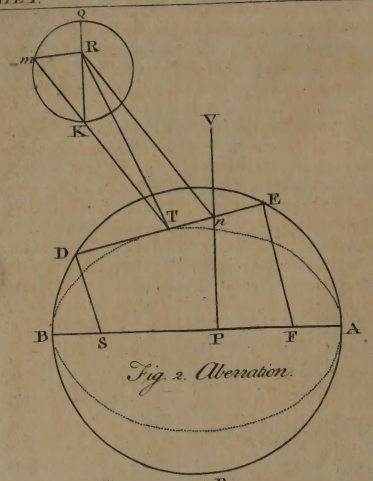

Fig. 2. Aberration.

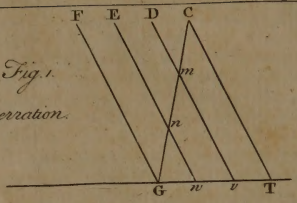

Fig. 1. Aberration.

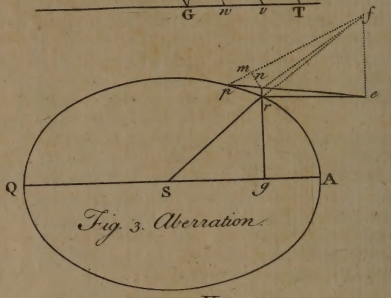

Fig. 3. Aberration.

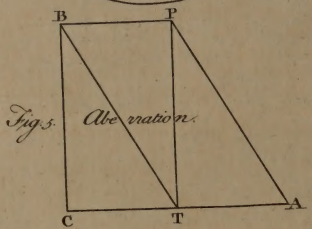

Fig. 5. Aberration.

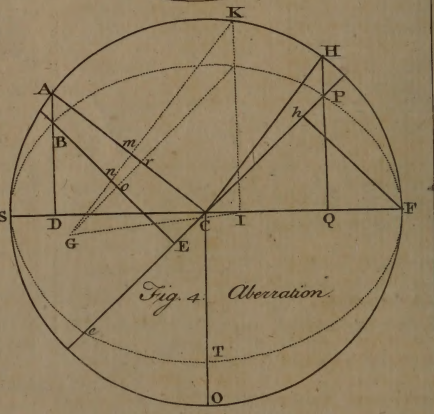

Fig. 4. Aberration.

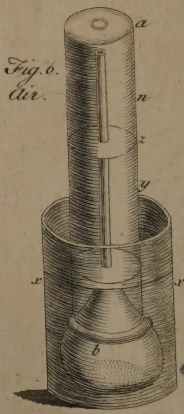

Fig. 6. Air.

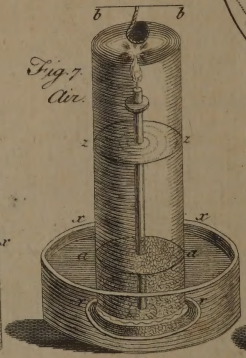

Fig. 7. Air.

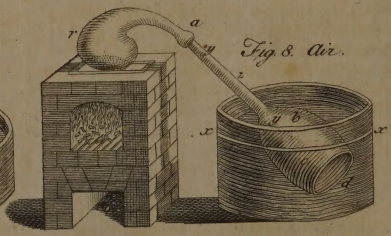

Fig. 8. Air.

tions, ſimilar to thoſe which Dr. Hook communicated to the public about fifty years before, in order, if poſſible, to diſcover the parallax of the earth's annual orbit.—The ſucceſs of the undertaking greatly depended on the accuracy of the inſtrument, for which they were obliged to the ingenious Mr. Graham, who compleated Mr. Molineux's paralactic ſector of twenty-four feet and a half, about the end of November, 1725; and on December 3, following γ Draconis was for the firſt time obſerved at Kew, as it paſſed near the zenith of that place. Similar obſervations were made on the fifth, eleventh, and twelfth days of the ſame month; when they thought it was needleſs to continue the obſervations any longer at that ſeaſon, it being part of the year when no ſenſible difference of the parallax of that ſtar could be expected.—Dr. Bradley, however, whoſe natural genius was continually prompting him to make obſervations, remaining at Kew, adjuſted the inſtrument as uſual, and obſerved the ſame ſtar on December 17; when, in comparing the laſt with his former obſervations, he found it had paſſed more ſoutherly that day than when obſerved before.—He attributed the cauſe of this appearance to the uncertainty of the obſervations; and concluded, that either this or the foregoing were not ſo exact as they before had ſuppoſed; for which reaſon, on December the 20th, they repeated the obſervations again, in order to determine from whence this difference proceeded; and found the ſtar now paſſed more ſoutherly than before: about the 26th of March following they found the ſtar 20″ more ſoutherly than at the firſt obſervation; after which it was obſerved to be ſtationary for ſome time; but about the middle of April it appeared to be returning back: and about the beginning of June it paſſed at the ſame diſtance from the zenith as it had done in December, when firſt obſerved. In September following, it appeared 39″ more northerly than it was in March; the contrary way to what it ought to appear by the annual parallax of the ſtars. From September the ſtar returned towards the ſouth, till it arrived in December to the ſame ſituation it was in at that time twelve months, allowing for the difference of declination ariſing from the preceſſion of the equinox. This was a ſufficient proof to convince them that the cauſe of this apparent motion of the ſtar was not owing to the inſtrument; and to find one adequate to the effect ſeemed a difficulty. A nutation of the earth's axis firſt offered itſelf on this occaſion, but was ſoon found inſufficient: for tho' the change of declination of γ Draconis might have been accounted for; yet it would not, at the ſame time, agree with the phenomena in the other ſtars; particularly in a ſmall one almoſt oppoſite in right aſcenſion to γ Draconis, at nearly the ſame diſtance from the north pole of the equator; for tho' the ſtar ſeemed to move the ſame way as a nutation of the earth's axis would have made it; yet it changed its declination but about half as much as γ Draconis in the ſame time, as appeared upon comparing the ſame obſervations made upon the ſame days at different ſeaſons of the year. This plainly proved that the apparent motion of the ſtar was not occaſioned by a real nutation; ſince, if that had been the caſe, the alterations in both ſtars muſt have been nearly equal.

The great regularity of the obſervations left them now no room to doubt, but that there was ſome regular cauſe that produced this unexpected motion, which did not depend on the uncertainty or variety of the ſeaſons of the year. Upon comparing the obſervations with each other, it was diſcovered that, in both the before-mentioned ſtars, the apparent difference of declination from the maxima was always nearly proportionable to the verſed ſine of the ſun's diſtance from the equinoctial point. This was an inducement to think that the cauſe, whatever it was, had ſome relation to the ſun's ſituation with reſpect to theſe points. But not being able to frame any hypotheſis at that time, ſufficient to ſolve all the phenomena, and being very deſirous to ſearch a little farther into this matter, Dr. Bradley began to think of erecting an inſtrument for himſelf at Wanſted, (which inſtrument is now at the Royal Obſervatory,) that, having it always at hand, he might, with the more eaſe and certainty, enquire into the laws of this new motion. Accordingly, by the contrivance and help of the ſame ingenious Mr. Graham, his inſtrument was fixed up the 10th of Auguſt 1727. As the place where his inſtrument was hung in ſome meaſure determined its radius, (which was $12\frac{1}{2}$ feet); ſo it likewiſe determined the length of the arc or limb, on which the diviſions were made to adjuſt it; for the arc could not conveniently be extended farther than to reach $6° \frac{1}{2}$ on each ſide the zenith. This indeed was ſufficient, ſince it gave him an opportunity of making choice of ſeveral ſtars, very different both in magnitude and ſituation; there being more than two hundred inſerted in the Britiſh Catalogue, that may be obſerved with it.

He had not been long obſerving before he perceived, that the notion they before had entertained of the ſtars being fartheſt north and ſouth when the ſun was about the equinoxes, was only true of thoſe that were near the ſolſtitial coloure. And after he had continued to obſerve ſome months, he diſcovered what he then thought to be a general law obſerved by all the ſtars, namely, that each of them became ſtationary, or was fartheſt north or ſouth when it paſſed over his zenith at ſix of the clock, either in the morning or evening. He perceived likewiſe, that whatever ſituation the ſtars were in with reſpect to the cardinal points of the ecliptic, the apparent motion of every one tended the ſame way, when they paſſed his inſtrument about the ſame hour of the day or night; for they all moved

southward while they passed in the day, and northward when in the night: so that each was farthest north when it came about six o'clock in the evening, and farthest south when it came about six o'clock in the morning.

Though he afterwards discovered that the maxima in most of these stars do not happen exactly when they pass at those hours; yet, not being then able to prove the contrary, and supposing that they did, he endeavoured to find out what proportion the greatest alterations of declination in different stars, bore to each other; it being very evident that they did not all change their declination equally.—It has been already mentioned, that it appeared from observation, that γ Draconis altered its declination about twice as much as the aforementioned small star, almost opposite to it: but examining the matter more particularly, he found that the greatest alteration of declination of those stars was as the sine of the latitude of each respectively. This made him suspect that there might be the like proportion between the maxima of other stars; but here he found observations to disagree with such an hypothesis, and deferred any farther enquiry till he should have made a series of observations in all parts of the year.

When the year was completed, and he had thoroughly examined and compared his observations together, he was convinced that the apparent motion of the stars was not owing to a nutation of the earth's axis, nor to any alteration in the plumb-line with which the instrument was constantly rectified. Refraction was also considered; but here also nothing satisfactory appeared. At last this ingenious astronomer conjectured, that all the phenoma hitherto mentioned proceeded from the progressive motion of light, and the earth's annual motion in its orbit; for if light be propagated in time, he perceived that the apparent place of a fixed object, would not be the same when the eye is at rest, as when it is moving in any other direction than that of a line passing through the eye and object; and that when the eye is moving in different direction, the apparent place of the object would be different.

The late ingenious Mr. T. Simpson of Woolwich has given us the following propositions and corollaries, in his Miscellaneous Tracts, and which fully and concisely explain this phenomenon.

PROPOSITION I.

If the velocity of the earth in its orbit bears any sensible proportion to the velocity of light, every star in the heavens must appear distant from its true place; and that by so much the more, as the ratio of those velocities approaches nearer to that of equality.

For if, while the line CG (plate I. *fig.* 1.) is described by a particle of light coming from a star in that direction, the eye of an observer at T be carried, by the earth's motion, thro' TG; and CT be a tube made use of in observing; and a particle of light, from the said star, be just entring at C the end of its axis; then when the eye is arrived at v, the tube will have acquired the position vD parallel to TC, and the said particle will be at the point m, where the line CG interfects the axis of the tube; because GT : GC :: Tv : Cm. Let now the tube, by the earth's motion, be brought into the position Ew; then because GT : GC :: Tw : Cn, the particle will be at n, and therefore is still in the axis of the tube: therefore when it enters the eye at G, as it has all the time been in the axis of the tube, it must consequently appear to have come in the direction thereof, or to make an angle with TH, the line that the earth moves in, equal to CTH, which is different from what it really does, by the angle GCT: whence it is evident that, unless the earth always moves in a right line directly to or from a given star (which is absurd to suppose) that star must appear distant from its true place; and the more so, as the velocity of the earth (in respect of that of light) is increased. And the same must necessarily be the case when the observation is made by the naked eye; for the supposition and use of a tube neither alters the real nor apparent place of the star, but only helps us to a more easy demonstration.

PROPOSITION II.

To find the path which a star, thro' the aforesaid cause, in one entire annual revolution of the earth, appears to describe.

Let ATBA (plate I. *fig.* 2.) be the orbit of the earth; S the sun in one focus; F the other focus; T the earth moving in its orbit from A towards B; DT n a tangent at T; and SD, FE perpendiculars thereto: Let QmKRQ be part of an indefinite plane parallel to that of the ecliptick, passing thro' R the centre of the given star; and take Tn to TR, as the velocity of the earth in its orbit at T, to that of a particle of light coming from the said star: Let Tm be parallel to nR; PnV perpendicular to AB; and QRK parallel to PnV: Then from the foregoing proposition it is manifest, that a ray of light coming from R to the earth at T, will appear as if it proceeded from m, where the line Tm, produced, interfects the said parallel plane; and therefore, because Tm is parallel to Rn, and any parallelogram, interfecting two parallel planes, cuts them alike in every respect, it is evident that Rm must be equal to Tn, and Qm to VnD; wherefore, since D and P are equal to two right angles, DSP and DnP must be equal, also, to two right angles, and consequently Qm (= VnD) = DSP = AFE. But Tn or Rm, expressing the celerity of the earth at T, is known to be inversely as SD; or because

SD

SD×FE is every where the same, directly as FE; wherefore the angles AFE, QR*m* being every where equal, and R*m* in a constant proportion to FE, the curve Q*m*K described by *m*, the apparent place of the star in the said parallel plane, will, it is manifest, be similar in all respects to AEB described by the point E: but this curve is known to be a circle; therefore Q*m*K must likewise be a circle, whose diameter QRK is divided by R, the true place of the star in the same proportion as the transverse axis of the earth's orbit is divided by either of its foci. Wherefore, forasmuch as a small part of the circumjacent heavens may, in this case, be considered as a plane passing perpendicular to a line joining the eye and star, it follows, from the principles of orthographic projection, that the star will be seen in the heavens as describing an ellipsis, whose center (as the excentricity of the orbit is but small) nearly coincides with the true place of the star, except the said place be in the pole or plane of the ecliptic; in the former of which cases the star will appear to describe a circle, and in the latter an arch of a great circle of the sphere, which, by reason of its smallness, may be considered as a right line. But these conclusions will perhaps appear more plain from the next proposition, where, for the sake of ease and brevity, the earth is considered as moving in an orbit perfectly circular, from which her real orbit does not greatly differ.

PROPOSITION III.

Having given, from experiment, the ratio of the velocity of light, to that of the earth in its orbit, and the true places of the sun and a star, to find the apparent place of the star from thence arising.

Let A*r*QA (plate I. fig. 3.) be the earth's orbit, considered as a circle; S the sun in the center thereof; *r* the earth moving about the same from A towards Q, *re* a line, which being produced, shall pass through the ecliptic place of the given star, AS parallel and *gr* perpendicular thereto: let *ef* be perpendicular to the plane of the ecliptic, so that *rf* being equal to S*r* or radius, *re* may be the cosine of the latitude of the given star: this being premised, it is manifest that the true place of the star from the earth will be in the direction *rf*, and with respect to the ecliptic, in the line *re*; therefore the angle S*re* (=QS*r*) being the difference of longitudes of the sun and star, is given by the question. Let *rg*, the sine of the supplement of this angle, be denoted by *b*, its cosine S*g*, by *c*, the sine of the given latitude or *fe*, by *s*; and the radius S*r* or *fr* by unity; and, while a particle of light is moving along *fr*, let the earth be supposed to be carried in its orbit from *r* to *p*, over a distance signified by *r*, and *pe*; *pf* being drawn, make *rn* and *nm* perpendicular thereto: then, because of the exceeding smallness of *pr*, it may be considered as a right line, and we shall have 1 (S*r*) : *b* (*rg*) :: *r* (*pr*) : *rb* (=*pn*); and 1 : *r* :: *c* : *rc* (=*rn*), by the similarity of the triangles *prn*, S*rg*, whence as 1 (*fp*) to *s* (*fe*) so is *rb*, to *rbs* (=*nm*) the sine of the angle *nfm*: but since the sine, or tangent, of a very small arch differs insensibly from the arch itself, these values *rc* and *rbs* may be taken as the measures of the angles *rfn*, and *nfm*: hence we have, as the semiperiphery A*r*Q (=3.14159, &c.) to 648000 (the seconds in 180 degrees) so is *rc* to $\frac{648000\ r\ c}{3.14159,\&c.}$ (the number of seconds in the angle *rfn*); and as 3.14159, &c. : 648000 :: *rbs* : $\frac{648000\ r\ s\ b}{3.14159,\&c.} = nfm$: therefore, as the earth moves from *r* to *p*, while a particle of light is describing *fr*, it is manifest from what has preceded, that the star will appear removed from the great circle, passing through its true place, and the pole of the ecliptic by $\frac{648000\ r\ c}{3.14159,\&c.}$ seconds, and to have its latitude increased by $\frac{648000\ r\ s\ b}{3.14159,\&c.}$ seconds. Q. E. I.

COROL. I.

Hence, if C (fig. 4.) be the true place of the star, SCF its parallel of latitude, and about C, as a center, the ellipsis FPSTE, and circle FHSOF be described so, that FC may be $=\frac{648000\ r}{3.14159,\&c.}$ and TC, the semiconjugate axis, in proportion thereto as *s* to 1; and, if the angle SCH be taken equal to the difference of longitudes of the sun and star, then in the point P, where the elliptical periphery is intersected by the right line HQ, falling perpendicularly on FS, the star will appear to be posited. For as 1 (*radius*) : *b* (sine of QCH) :: CH : *b*×CH=HQ; but by the relation of the two curves CH : CT :: *b*×CH (=HQ) : PQ; that is, by construction, $1 : s :: \frac{648000\ r}{3.14159,\&c.} \times b : \frac{648000\ r\ s\ b}{3.14159,\&c.} = PQ$; again, as 1 (*radius*) : *c* (the cosine of QCH) :: $\frac{648000\ r}{3.14159,\&c.}$ (=CH) : $\frac{648000\ r\ c}{3.14159,\&c.}$ =CQ; which expressions are the very same with those above determined.

COROL. II.

Therefore it follows, that while the sun appears to pursue his course through the ecliptic, the star will be seen as moving from F towards L and S, and so on till it hath described the whole elliptic periphery FLSTF, that its latitude will be the least at T, and its apparent longitude the greatest possible, when the angle SCH, shewing the distance of the sun and star in the ecliptic, is equal to two right ones. It also follows, that the greater axis,

axis of the ellipſes, which all ſtars appear to deſcribe, are equal, and found by obſervation to amount to 40$\frac{1}{2}$ ſeconds of a great circle. The term 20″, 25, which frequently occurs in the practical rules hereto annexed, being put for the half thereof. It follows, moreover, that the greateſt aberrations, or *maxima*, in longitude, will be as the coſines of the latitudes inverſely; and the *maxima* in latitude, as the ſines of the ſame latitudes directly.

COROL. III.

Hence may alſo be found, the ſtars apparent right aſcenſion and declination; for let ECP be the parallel of the ſtar's declination, P the apparent place of the ſtar, when in that parallel, make CA perpendicular to CH, ABD to SF, and BE to PC, and let HK, or the angle HCK, be any diſtance gone over by the earth in the ecliptic, while the ſtar by its apparent motion moves through the correſponding diſtance PL: let K *m n* G be parallel to HC, and L *r v* to PC: then, foraſmuch as KL is parallel to HP, the triangles GKL, CHP, muſt be equiangular; and therefore GL: CP:: KL: HP; but KL is to HP, as LI to QP, by the property of the curve, whence it will be GL: CP :: LI: QP; wherefore the ſides GL, IL, CP, QP, about the equal angles GLI, CPQ, being proportional, the triangles GLI, CPQ muſt be ſimilar, and therefore the angle GIL a right one; and conſequently the right line SF, the locus of the point G. Therefore, as the angles *n*, *m*, *r*, *v*, are all given, or continue invariable; let the angle SCK, or the ecliptic diſtance of the ſun and ſtar be what it will, the ratio of C *m* to CG, will always be given; but the ratio of CG to C *r* is given: therefore the ratio of C *m* to C *r* is likewiſe given: hence becauſe *r v* is parallel to CE, the ratio of C *m* to E *v* will be given. But E *v* is the difference of the true and apparent declinations; and C *m*, as the ſine of the angle HCK: whence it is manifeſt, that the aberration of declination, at any time, is as the ſine of the ſun's elongation from either of the two points wherein he is, when the true and apparent declinations are the ſame; and therefore C *m* will be to E *v*, or AC to EB, the greateſt aberration, as QH to F *b*; that is, as the ſine of HCF to the ſine of PCQ: but PCQ, being equal to the angle of poſition, is given, whoſe tangent, it is obvious, is to the tangent of HCF, as QP to QH, or as CT to CO, or laſtly (by conſtruction), as the ſine of the ſtar's latitude to radius: hence the angle HCF is given, from which, by help of the foregoing theorem or proportion, the required aberration of declination at any time, and in any caſe, may be readily obtained.

The Public are obliged to the ingenious and celebrated aſtronomer Dr. Bevis, for the following

PRACTICAL RULES

For finding the Aberration in longitude, latitude, declination, and right aſcenſion.

SYMBOLS.

A, the aberration at any given time; M the greateſt aberration, or maximum; ☉, the ſun's place in the ecliptic, when the ſtar's apparent longitude, latitude, declination, or right aſcenſion, being the ſame as the true, tends to exceſs; P, the ſtar's angle of poſition; Z, the ſun's elongation from its neareſt ſyzygy with the ſtar, at the time of ☉.

For the aberration in longitude.

☉ is always three ſigns after the ſtar's true place in the ecliptic.

Prob. 1. To find M.

Coſine ſtar's latit. : rad. :: 20 : M.

Prob. 2. To find A.

Rad. : ſine ſun's elongat. from ☉ :: M : A.

Otherwiſe, without M.

Coſin. ſtar's latit. : ſin. ſun's elongat. from ☉ :: 20″ : A.

For the aberration in latitude.

☉ is always at the ſtar's oppoſition to the ſun.

Prob. 1. To find M.

Rad. : ſin. ſtar's latit. :: 20″ : M.

Prob. 2. To find A.

Rad. : ſin. ſun's elongat. from ☉ :: M : A.

Otherwiſe, without M.

Rad^{s}. ſin. ſtar's latit. × ſin. ſun's elongat. from ☉ :: 20″ : A.

Otherwiſe,

Coſec. ſtar's latit. ſin. ſun's elongat. from ☉ :: 20″ : A.

For the aberration in declination.

Prob. 1. To find ☉.

Sin. ſtar's latit. : rad. :: tang. P : tang. Z.

Then if the ſtar (in reſpect of that pole of the equator which is of the ſame denomination as the ſtar's latitude) be in a ſign

1. Aſcending, and P be acute, Z taken from the oppoſite to its true place, gives ☉.

2. Aſcending, and P be obtuſe, Z added to its true place, gives ☉.

3. Deſcending, and P be acute, Z added to the oppoſite to its true place, gives ☉.

4. Deſcending, and P be obtuſe, Z taken from its true place, gives ☉.

Provided in all theſe caſes that the ſtar's declination and latitude be both north or both ſouth; but if one be north and the other ſouth, then, for *its true place*, read *oppoſite to its true place*, and vice verſâ.

Prob. 2. To find M.

Sin. Z : ſin. P :: 20 : M.

Prob.

Prob. 3. To find A.

Rad. : ſin. ſun's elongat. from ☉ :: M : A.

Otherwiſe, without M.

Rad. × ſin. Z : ſin. ſun's elongat. from ☉ × ſin. P :: 20″ : A.

For the aberration in right aſcenſion.

Prob. 1. To find ☉.

Sin. ſtar's latit. : rad. :: cotang. P : tang. Z.

Then, if the ſtar (in reſpect of that pole of the equator, which is of the ſame denomination as the ſtar's latitude) be in a ſign

1. Aſcending, and P be acute, Z added to its true place, gives ☉.

2. Aſcending, and P be obtuſe, Z taken from its true place, gives ☉.

3. Deſcending, and P be acute, Z taken from the oppoſite to its true place, gives ☉.

4. Deſcending, and P be obtuſe, Z added to the oppoſite to its true place, gives ☉.

Prob. 2. To find M.

Coſ. ſtar's decl. × ſin. Z : coſ. P × rad. :: 20″ : M.

Prob. 3. To find A.

Rad : ſin. ſun's elongat. from ☉ :: M : A.

Otherwiſe, without M.

Coſin. ſtar's declinat. × ſin. Z : ſin. ſun's elongat. from ☉ × coſin. P :: 20″ : A.

REMARKS.

1. That ♑, ♒, ♓, ♈, ♉, ♊, are ſigns aſcending in reſpect of the north pole, and deſcending in reſpect of the ſouth pole of the equator. And ♋, ♌, ♍, ♎, ♏, ♐, are aſcending in reſpect of the ſouth pole, and deſcending in reſpect of the north pole of the equator.

2. That if the ſun's place be in that ſemicircle of the ecliptic which precedes ☉, A muſt be taken from the ſtar's true longitude, latitude, declination, or right aſcenſion, to ſhew the apparent; but if he be in the ſemicircle following ☉, A muſt be added.

3. That the rules give the values of M and A always in ſeconds and decimals of a degree.

From the preceding rules the following table is calculated, which will be found of the greateſt uſe to aſtronomers and navigators.

A TABLE of the Aberration in right aſcenſion of ſixteen principal ſtars, to every ten days in the year.

	Aldebaran.	Capella.	Rigel.	α Orionis.	Syrius.	Caſtor.	Procyon.	Pollux.	Regulus.	Spica.	Arcturus.	Antares.	α Lyrae.	α Aquila.	α Cygni.	Fomalhaut.	
Jan. 10	+15,0	+23,5	+16,8	+18,4	+20,5	+23,6	+19,9	+22,6	+15,6	+ 0,1	− 4,6	−15,6	−24,9	−19,9	−26,3	−14,1	10 Jan.
20	12,3	20,3	14,6	16,6	19,3	23,2	19,7	22,4	17,3	3,5	− 1,0	12,6	23,4	19,8	27,1	16,7	20
30	9,2	16,5	11,9	14,3	17,6	21,9	18,7	21,4	18,6	6,8	+ 2,5	9,2	21,3	19,0	27,1	18,8	30
Feb. 9	5,9	12,1	8,9	11,6	15,3	19,9	17,1	19,6	19,2	9,5	6,0	5,6	18,4	17,6	26,4	20,4	9 Feb.
19	+ 2,3	7,4	5,6	8,5	12,5	17,4	15,1	17,3	19,3	12,4	9,3	− 1,0	15,0	15,7	24,7	21,3	19
Mar. 1	− 1,3	+ 2,5	+ 2,1	5,2	9,5	14,4	12,6	14,5	18,8	14,7	12,2	+ 2,0	11,1	13,4	22,4	21,5	1 Mar.
11	4,8	− 2,4	− 1,4	+ 1,8	6,1	10,9	9,7	11,3	17,7	16,5	14,8	5,8	6,9	10,5	19,3	21,0	11
21	8,2	7,3	4,8	− 1,8	+ 2,6	7,1	6,6	7,8	16,0	17,9	17,0	9,3	− 2,6	7,5	15,6	20,1	21
31	11,3	11,9	8,1	5,2	− 1,0	+ 3,3	+ 3,2	4,0	13,9	18,7	18,6	12,6	+ 1,8	4,1	11,6	18,4	31
Apr. 10	14,1	16,1	11,1	8,4	4,5	− 0,9	− 0,2	+ 0,2	11,4	18,8	19,6	15,5	6,2	− 0,7	7,2	16,2	10 April
20	16,4	19,9	13,8	11,4	7,9	4,9	3,5	− 3,7	8,6	18,6	20,0	17,9	10,3	+ 2,6	− 2,7	13,6	20
30	18,2	23,1	15,8	14,1	11,1	8,7	6,8	7,4	5,5	17,7	19,9	19,8	14,1	5,9	+ 1,9	10,5	30
May 10	19,6	25,6	17,9	16,3	13,9	12,2	9,8	10,8	+ 2,4	16,3	19,4	21,1	17,5	9,0	6,5	7,3	10 May
20	20,3	27,3	19,2	18,1	16,1	15,5	12,4	14,1	− 0,9	14,5	18,1	21,7	20,4	11,8	10,8	3,8	20
30	20,5	28,2	19,9	19,4	18,2	18,2	15,0	16,8	4,1	12,3	16,4	21,8	22,6	14,3	14,9	− 0,2	30
June 9	20,2	28,5	20,1	20,0	19,1	20,5	17,0	19,1	7,2	9,8	14,3	21,4	24,4	16,4	18,5	+ 3,4	9 June
19	19,3	27,8	19,8	20,2	20,5	22,2	18,5	20,8	10,1	7,0	11,7	20,3	25,3	18,0	21,5	6,8	19
29	17,8	26,6	18,9	19,8	20,8	23,2	19,5	22,0	12,6	4,0	8,8	18,6	25,6	19,2	24,0	10,1	29
July 9	15,8	24,6	17,4	19,0	20,5	23,6	19,8	22,5	14,9	+ 0,9	5,7	16,5	25,2	19,8	25,8	13,1	9 July
19	13,4	21,6	15,5	17,4	19,8	23,4	19,7	22,4	16,8	− 2,3	+ 2,4	13,8	24,1	19,9	26,9	15,7	19
29	10,6	18,2	13,1	15,4	18,4	22,5	19,2	21,9	18,2	5,4	− 1,0	10,8	22,3	19,5	27,2	17,9	29
Aug. 8	7,6	14,4	10,4	13,1	16,5	21,0	18,0	20,5	19,0	8,3	4,3	7,5	19,9	18,4	26,9	19,7	8 Aug.
18	4,3	10,1	7,4	10,3	14,1	18,9	16,2	18,7	19,3	11,0	7,5	3,9	16,9	16,8	25,8	20,9	18
28	− 0,8	5,4	4,1	7,2	11,4	16,2	14,1	16,3	19,2	13,4	10,5	+ 0,2	13,4	14,8	23,8	21,4	28
Sept. 7	+ 2,6	− 0,6	− 0,7	3,9	8,2	13,1	11,5	13,4	18,4	15,4	13,3	− 3,5	9,6	12,3	21,3	21,4	7 Sept.
17	6,0	+ 4,2	+ 2,6	− 0,5	4,9	9,5	8,6	10,1	17,1	17,1	15,7	7,1	5,4	9,5	18,0	20,8	17
27	9,3	9,0	6,0	+ 2,9	− 1,2	5,7	5,4	6,5	15,3	18,3	17,6	10,5	+ 1,0	6,4	14,3	19,5	27
Oct. 7	12,3	13,5	9,2	6,3	+ 2,2	− 1,7	− 2,1	− 2,7	13,1	18,7	19,1	13,7	− 3,3	+ 3,0	10,2	17,7	7 Oct.
17	15,0	17,5	12,1	9,5	5,8	+ 2,3	+ 1,4	+ 1,2	10,4	18,8	19,9	16,4	7,7	− 0,4	5,6	15,3	17
27	17,2	21,2	14,8	12,5	9,2	6,4	4,8	5,1	7,5	18,3	20,1	18,7	11,7	3,8	+ 0,9	12,5	27
Nov. 6	18,9	24,2	16,9	15,1	12,2	10,2	8,1	8,8	4,2	17,2	19,8	20,4	15,5	7,2	− 3,8	9,2	6 Nov.
16	20,0	26,4	18,6	17,1	15,0	13,8	11,2	12,3	− 0,8	15,5	18,8	21,4	18,9	10,3	8,3	5,7	16
26	20,4	28,0	19,6	18,9	17,3	16,9	13,9	15,5	2,5	13,5	17,3	21,9	21,7	13,1	12,9	+ 2,0	26
Dec. 6	20,4	28,5	20,0	19,8	19,1	19,6	16,2	18,2	5,9	10,9	15,2	21,7	23,7	15,6	17,0	− 1,8	6 Dec.
16	19,7	28,2	20,0	20,0	20,4	21,0	18,0	20,3	9,1	8,0	12,7	20,8	25,0	17,6	20,5	5,6	16
26	18,2	27,0	19,2	21,0	20,7	22,9	19,3	21,7	11,9	4,9	9,8	19,1	25,6	18,9	23,4	9,2	26
31	17,3	26,1	18,6	19,7	20,7	23,3	19,6	22,2	13,3	3,2	8,0	18,1	25,5	19,4	24,5	10,9	31

Uſe of this Table. — Suppoſe the Aberration of Caſtor is wanted for Auguſt 18. In the angle of meeting, under Caſtor and againſt Aug. 18, is found 18″,9, which is to be ſubtracted (having the negative ſign) from the ſtar's mean right aſcenſion, which gives the apparent.

ABERRATION *of the planets*. This is always equal to the geocentric motion of the planet during the time which light takes up in coming from the planet to us.

The following demonſtration is taken nearly from a paper of Mr. Clairaut, among the Memoirs of the Royal Academy of Sciences at Paris for 1764.

It is well known that a force acting according to the diagonal of a parallelogram, is equal to two forces according to its two ſides; it is likewiſe known, that the motion of a planet, ſeen from the earth, or the motion of the earth ſeen from a planet, are exactly the ſame; ſo that if a planet appear to move one degree a day to an inhabitant of the earth, the earth appears to an inhabitant of that planet to move juſt one degree alſo in the ſame time.

This ſuppoſed, let P (*fig.* 5.) be the planet, which we will regard as immoveable, APT the apparent motion of the planet tranſlated to the earth: in the interval of time in which light comes from P to T, the earth having advanced from A to T is ſtruck by the ray of light, according to the direction PT, and alſo ſtrikes the ray, according to the direction AT, with the ſame velocity and force, as if the ray itſelf had met the eye with the velocity CT; thus the eye receives two compreſſions of the light, one according to PT, the other according to CT: and ſo, by a ſingle impreſſion, compounded of two others, it refers the planet to the diagonal BT: but the angle PTB is equal to the angle APT, which we have taken equal to the geocentric motion of the planet; therefore the abberration is equal to the motion which the planet has during the time which light takes up in coming from the planet to the ſpectator's eye.

For example, light takes up 8′ 7″½ of time in coming from the ſun to us; the ſun's motion in longitude, during that interval, is 20″ of a degree, whence it follows, that the ſun has conſtantly 20″ of abberration in longitude; and as the abberration cauſes the planet to appear on the ſame ſide the earth is going, and oppoſite that towards which the planet appears to be moving, it follows that if the longitude, for example, of a planet be increaſing, the abberration muſt diminiſh it; the ſame holds good of latitude, right aſcenſion, and declination.

On this principle Mr. Clairaut conſtructed the following table.—It contains the aberration of the planets according to their diurnal motion, and their diſtance from the earth, by only adding the conſtant logarithm 9,5292 to thoſe of the planet's diurnal motion in minutes, and of its diſtance from the earth, putting that of the ſun = 10, the ſum will be the logarithm of the aberration; which aberration is always to be added to the mean or computed longitude, latitude, right aſcenſion, or declination, to obtain thoſe poſitions, ſuch as they ſhould appear on obſervation, when they are decreaſing; but to be ſubtracted when they are increaſing.

A TABLE of the aberration of the planets in longitude, latitude, right aſcenſion, or declination.

Planet's diurnal motion.	Diſtance from the earth, that of the ſun being 10.								
	2.	3.	4.	5.	6.	7.	8.	9.	10.
D. M.	Sec.	Sec.	Sec.	Sec.	Sec.	Sec.	Sec.	Sec.	Sec.
0 8	0.5	0.8	1.1	1.4	1.6	1.9	2.2	2.4	2.7
0.16	1.1	1.6	2.2	2.7	3.2	3.8	4.3	4.9	5.4
0.24	1.6	2.4	3.2	4.1	4.9	5.6	6.5	7.3	8.1
0 32	2.2	3.2	4.3	5.4	6.5	7.5	8.7	9.7	10.8
0.40	2.7	4.1	5.4	6.8	8.1	9.4	10.8	12.2	13.5
0.48	3.2	4.9	6.5	8.1	9.7	11.3	12.9	14.6	16.2
0.56	3.8	5.7	7.6	9.4	11.4	13.2	15.1	17.0	18.9
1.00	4.1	6.1	8.1	10.1	12.1	14.2	16.2	18.3	20.3
1. 4	4.3	6 5	8.7	10.8	12.9	15.2	17.3	19.5	21.6
1. 8	4.6	6.9	9.2	11.5	13.8	16.1	18.4	20 7	23.0
1.12	4.9	7.3	9.7	12.2	14 6	17.0	19.5	21.9	24.4
1.16	5.1	7.7	10.3	12.9	15.4	18.0	20.1	23.1	25.7
1.20	5.4	8.1	10.8	13.5	16.2	18.9	21.6	24.3	27.1
1.24	5.7	8.5	11.4	14.2	17.0	19.9	22.7	25.6	28.4
1.28	5 9	8.9	11.9	14.9	17 9	20.8	23.8	26.8	29.8
1.32	6.2	9.3	12.4	15.6	18.7	21.8	24.9	28.0	31.1
1.36	6.4	9.7	13.0	16.2	19.5	22.7	26.0	29.2	32.5
1.40	6.8	10.2	13.5	16.9	20.3	23.7	27.1	30.4	33.8
1.44	7.0	10.6	14.1	17.6	21.1	24.6	28.1	31.7	35.2
1.48	7.3	11.0	14.6	18.3	21.9	25.6	29.2	32.9	36.5
1.52	7.6	11.4	15.2	18 9	22.7	26.6	30.3	34.1	37.9
1.56	7.8	11.8	15.7	19.6	23.5	27.5	31.4	35.3	39.2
2.00	8.1	12.2	16.2	0.3	24.4	28.4	32.5	36.5	40.6
2. 4	8.4	12.6	16.8	1.0	25.2	29.4	33.6	37.7	41.9
2. 8	8.6	13.0	17.3	21.6	26.0	30.3	34.6	39.0	43.3
2.12	8.9	13.4	17.9	22.3	26.8	31.3	35.7	40.2	44 6
2.16	9.1	13.8	18.4	23.0	27.6	32.2	36.8	41.4	6.0

Add to the obſerved or apparent poſition, and ſubtract from the mean poſition, when they are increaſing.

Subtract from the obſerved place, and add to the computed place, when the planet's motion is diminiſhing.

Although this table goes no farther than to the diſtance 10, equal to that of the ſun, yet it may be extended *ad libitum*, by ſimple multiplication: For example, if a comet, twice as far from the earth as the ſun, that is 20, has 1 degree of diurnal geocentric motion retrograde; take, in the column of 2, the abberation for 1 degree, which is 4″,1, and multiply it by 10; the product will be 41″,0, to be ſubtracted from the obſerved place of the comet.

We ſhall ſubjoin two tables more for the abberration, of the planets, whoſe uſe is ſtill more eaſy.

Aberra-

Elongation, or distance, from the sun, seen from the earth.	Aberration in longitude.				
	Mars	Jupiter	Saturn	Elongation	Venus
Signs Deg.	Sec.	Sec.	Sec.		Sec.
☌ . XII 0	−36	−28	−26	Sup. ♂ 0	−43
15	35	28	25	15	41
I . XI 0	32	26	23	30	34
15	28	22	20	45	19
II . X 0	23	18	16	Greateſt digr.	14
15	17	14	11	45	9
III . IX 0	12	8	6	30	0
15	7	3	1	15	+ 3
IV. VIII 0	3	+ 1	+ 4	Infer. ♂ 0	3
15	0	5	8		
V . VII 0	+ 2	8	11		
15	3	10	13		
VI . VI 0	4	11	13		

Mercury's aberration in longitude.				
Diſtance of the ſun.		Aphel.	Mean diſt.	Perihel.
	Deg.	Sec.	Sec.	Sec.
Superior part	0	−49	−51	−55
of the orbit.	5	48	59	54
	10	46	48	49
	15	43	43	38
	20	38	33	::
	25	30	..	
Greateſt digreſſion		17	18	19
	25	5	..	::
	20	+ 1	+ 4	
Inferior part	15	5	5	0
of the orbit.	10	7	9	+10
	5	9	11	14
	0	9	12	16

When Mercury is ſome degrees from his greateſt digreſſions, his geocentric motion ſhould be carefully had from aſtronomical tables or ephemerides, and his aberration be made out from the firſt table of the planet's abberration.

Mercury's abberration in latitude, at his deſcending node is $4''\frac{1}{4}$; that of the other planets is not near ſo much.—The ſun's aberration is conſtantly $20''$ in longitude; but may alter its declination $8''$ near the equinoxes, and is nothing about the ſolſtices.—The moon's aberration never amounts to one ſecond.

ABERRATION, in optics, a deviation of the rays of light, refracted by a ſpherical lens, or reflected by a ſpherical ſpeculum, and therefore cannot unite in one and the ſame focal point. See SPECULUM, LENS, and FOCUS.

ABETTOR, in law, implies a perſon who encourages another to perform ſome criminal action, or who ſeconds and aſſiſts him in the performance itſelf. See the article ACCESSORY.

But though there may be abettors in felony, murders, &c. there can be none in treaſon; the law conſidering every individual concerned in treaſon as a principal.

ABEYANCE, ABEIANCE, or ABBAYANCE, in law books, ſignifies ſomething that exiſts in expectation or remembrance only.

Thus if a church becomes vacant by the death of the incumbent, the freehold is ſaid to be in abeyance, till a new rector, &c. is appointed and inducted; for the patron has not the fee, but merely the right of preſenting to it, the freehold itſelf being in the incumbent thus preſented, and conſequently, till ſuch preſentation is made, in nobody.

ABIB, the name given by the Jews to the firſt month of their ſacred or eccleſiaſtical year: it was afterwards called Niſan. It commenced at the vernal equinox, and, according to the courſe of the moon, by which their months were regulated, anſwered to the latter part of March and the beginning of April.

Before the Jews were led away captive into Egypt, their year began in the month Tiſri, which is our September. But afterwards when they came out of Egypt, it was ordained by God, that the ſacred year, or calendar of feaſts, and ceremonies, &c. ſhould commence in the month Abib, which is the ſeventh month of the civil year.

This word is Hebrew, and ſignifies *an ear of corn:* this month was probably ſo called, becauſe at that ſeaſon the firſt corn was ripe in Paleſtine.

ABIES, the fir-tree. See the article FIR-TREE.

AB-INTESTATE, in the civil law, is applied to a perſon who inherits from one who died inteſtate, or without a will. See INTESTATE.

ABISHERING, in old law books, implies the being exempt from all amercements, and tranſgreſſions of any kind.

ABJURATION, in our ancient cuſtoms, implied an oath taken by a perſon guilty of felony, and who had fled to a place of ſanctuary, whereby he ſolemnly engaged to leave the realm for ever.

ABJURATION is now uſed to ſignify the renouncing, diſclaiming, and denying upon oath, the pretender to have any manner of right to the throne of theſe kingdoms.

ABJURATION OF HERESY, the ſolemn recantation of ſome doctrine as falſe and wicked.

ABLACTATION, the act of weaning a child from the breaſt. See the article WEANING.

ABLACTATION, in horticulture, is a term formerly uſed for a particular method of grafting, called, by modern gardeners, inarching, or grafting by approach. See GRAFTING *by approach.*

ABLAQUEATION, in gardening, the art of removing the earth, and laying bare the roots of trees in winter, that they may be more readily expoſed

poſed to rains, ſnow, air, &c. which was formerly thought neceſſary for their future welfare; but experience has ſhewn it to be a dangerous practice, eſpecially, where the trees are much expoſed to the winds, particularly the ſouth-weſt, which are generally the moſt violent: and it is in a great meaſure laid aſide in the preſent practice of gardening.

ABLATIVE, in the Latin grammar, is the name of the ſixth caſe, and peculiar to that language.

It is oppoſed to the dative, which expreſſes the action of giving, and the ablative that of taking away.

ABLUENTS, in medicine, are the ſame with diluters, or ſuch remedies as diſſolve and carry off acrimonious and ſtimulating ſalts, from any part of the body, eſpecially from the ſtomach and inteſtines.

ABLUTION, in antiquity, a religious ceremony, practiſed by the Romans, and conſiſted in waſhing the body before they began the ſacrifice.

The Romans, in all probability, learned this ceremony from the Jews; ſince we read in Scripture, that Solomon placed at the entry into the temple which he erected to the honour and ſervice of the true God, a capacious laver, which the text calls a brazen ſea, where the prieſts waſhed themſelves before they offered ſacrifice; having previouſly ſanctified the water, by throwing into it the aſhes of a victim offered in ſacrifice.

The Mahometans ſtill uſe the ceremony of ablution.

ABLUTION, in chemiſtry, ſignifies the waſhing away the ſalts of any body, by frequent affuſions of warm water.

ABOARD, Ital. *aborde*, Fr. *aborde*, any part on the deck or inſide of a ſhip: hence any perſon who aſcends a ſhip's ſide, to go on the deck, or into the apartments, is ſaid to go aboard.

ABOLITION, in a general ſenſe, implies the act of defraying a thing, or reducing it to nothing.

ABOLITION, in law, ſignifies the repealing any law or ſtatute.

ABOMASUS, or ABOMASUM, in comparative anatomy, one of the ſtomachs, or ventricles, of ruminating animals, or ſuch as chew the cud.

All ruminating animals have four ſtomachs, viz. the rumen, or ſtomach, properly ſo called, the reticulum, the omaſus, and the abomaſus.

The abomaſus, or laſt of the four ſtomachs, is vulgarly called the maw; being the receptacle where the chyle is formed, and from which the food deſcends immediately into the inteſtines.

ABOMINATION, in the ſacred writings, is generally uſed to expreſs idols and idolatry. Thus in Ezek. xx. 7. "Caſt ye away every man the "*abominations* of his eyes, and defile not yourſelves "with the *idols* of Egypt." And again in Exod. viii. 26. Moſes ſays, "We ſhall ſacrifice the *abo-* "*mination* of the Egyptians to the Lord." It is not at all to be wondered at that idolatry ſhould be called an abomination, as it was accompanied with licentious ceremonies, and the vileſt and moſt abominable practices. The Iſraelites, who were ſhepherds, are ſaid, in Gen. xlvi. 34. to be an abomination to the Egyptians, becauſe they ſacrificed their idols, or their ſacred animals, to which they paid divine worſhip. The abomination of deſolation (mentioned by St. Matthew xxiv. 15. "When "therefore ye ſhall ſee the abomination of deſola- "tion, ſpoken of by Daniel the prophet, ſtand "in the holy place,") means the enſigns of the Roman army, on which were painted the images of animals, as well as of their gods and emperors: at the laſt ſiege of Jeruſalem, which was carried on under Titus, theſe enſigns were lodged in the temple, when the city was taken.

ABORIGINES, in geography, a name given to the original or firſt inhabitants of any country, in contradiſtinction to colonies or new inhabitants from ſome other part of the earth.

The term aborigines is famous in antiquity; and tho' at preſent taken as an appellative, it was originally the proper name of a certain people of Italy, who inhabited the ancient Latium, or country now called Campagna di Roma, when Æneas, with his Trojans, came into Italy.

In this ſenſe the Aborigines are diſtinguiſhed from the Janigenæ, from the Siculi, from the Grecians, and from the Latins, whoſe name they afterwards aſſumed.

Authors are greatly divided with regard to theſe Aborigines; ſome will have them to be the original inhabitants ſettled there by Janus, or by Cham, ſoon after the diſperſion at Babel; ſome think they were originally Arcadians, parties of whom were brought into Italy at different times; and others derive this nation from the Lacedæmonians, who fled into Italy from the ſevere diſcipline of Lycurgus. Some again will have them to have been rather of Barbarian than Grecian original, and to have come either from Scythia or Gaul; while others believe they were deſcended from the Canaanites, who were driven out of their own country by Joſhua.

ABORTION, in medicine, an untimely or premature delivery of the fœtus.

An abortion may proceed from various cauſes; as immoderate evacuations, violent motions, ſudden paſſions, frights, &c. It may alſo happen at any time of pregnancy; but if before the ſecond month, it is uſually called a falſe conception.

A continual or intermitting fever generally precedes an abortion, together with a pain in the loins and head; a heavineſs in the eyes; a bearing down and conſtriction of the abdomen; and when the time of miſcarriage is juſt at hand, the pains are much the ſame with thoſe in labour; and felt prin-

cipally about the os pubis, and os ſacrum. The breaſts, which were before turgid, now ſubſide and become flaccid; the patient is apt to faint, and a ſerous humour ouzes from the uterus.

If the time of pregnancy be far advanced, ſo that the fœtus muſt needs be large; if the cauſes of abortion were violent; if the patient be ſtrongly convulſed; if a large hæmorrhage either precede or follow; if the patient be of a weak conſtitution; if the fœtus be putrefied; or if the woman was never delivered of a live child; the caſe may be conſidered as dangerous: but, with other circumſtances, abortion very rarely proves mortal.

Upon the firſt appearance of the ſymptoms of abortion, the patient muſt be put to bed, and the paſſions of the mind kept calm and moderate. The food ſhould be eaſy of digeſtion. The liquor may be wine, diluted occaſionally with water: but in caſe of a diarrhœa, large floodings, &c. the white decoction appears to be the moſt proper liquor. In other reſpects, the diet and regimen muſt be ſuited to the particular ſymptoms which happen to attend abortion; whether they are coſtiveneſs, a teneſmus, vomiting, &c.

An habitual weakneſs, or laxity of the uterine veſſels, ſhould be treated as the fluor albus; but except the patient be of a thin or hectical conſtitution, a decoction of guaiacum, will, in this caſe, prove very ſerviceable.

When the flooding is attended with the breaking out of the waters, and violent pain at the bottom of the abdomen, the time of abortion is judged near. In this caſe, the uſe of aſtringents is to be omitted: as the abortion is natural or unnatural, the midwife is to perform the part adapted to a natural or unnatural birth: the ſame external and internal medicines, which tend to bring away the ſecundines, and promote lochia, being proper in both caſes.

ABORTIVE, in a general ſenſe, implies any thing which comes before its proper time, or miſcarries in the execution.

ABORTIVE *velom*, that made of the ſkin of an abortive calf. See VELOM.

ABRA, a ſilver coin ſtruck in Poland, and nearly equal in value to an Engliſh ſhilling.

ABRACADABRA, a magical word, which being written in a certain form, a certain number of times, was, in the ages of ignorance and ſuperſtition, ſuppoſed to have the virtue of a charm or amulet, in curing agues.

ABRAHAMITES, were an order of monks, who, in the ninth century, were exterminated by Theophilus for idolatry. It is the name alſo of a ſect of heretics, who renewed the errors of Paulus and his followers.

ABRASION, in ſurgery, the act of wearing away the natural mucus which covers the membranes, particularly thoſe of the ſtomach and inteſtines, by corroſive medicines, &c.

ABRASAX, or ABRAXAS, a myſtical term that occurs in the antient theology and philoſophy of certain heretics, particularly the followers of Baſilides. Some moderns, on the credit of Tertullian and Jerome, have affirmed that this archheretic called the Supreme Being by the name of *Abraxas*; but this is not very probable, as Ireneus tells us, that the Baſilidians gave no name whatever to the Almighty, but ſay that the Father of all things is ineffable, and without name.

It ſeems as if this word denoted Mithras, or the ſun, which was the God of the Perſians. For by computing the value of each letter, as the Greeks were wont to do,

A	1
β	2
ρ	100
α	1
ς	200
α	1
ξ	60
	365

we come by the number 365, which is the number of days contained in a ſolar year.

In the 17th century two taliſmans were found, on one of which was the word ABPACAΣ in Greek capitals, and on the other, which is ſtill to be ſeen in the cabinet of St. Genevieve, the following inſcription: ABPACAΣ. ΑΔΩΝΑΙ. ΔΑΙΜΟΝΩΝ. ΔΕΞΙΑΙ. ΔΥΝΑΜΕΙC. ΦΥΛΑΞΑΤΕ. ΟΥΛΠΙΑΝΟΝ. ΠΑΥΛΕΙΝΑΝ. ΑΠΟ. ΠΑΝΤΟC. ΚΑΚΟΥ. ΔΑΙΜΟΝΟC. which is, "Abraſax, lord of demons, propitious powers, preſerve Ulpius Paulinus from every evil demon." The word Adonai being made uſe of here immediately after Abraſax, clearly points out that it is of Oriental, and not of Greek extraction: for which reaſon, what Beauſobre has ſaid is rather ingenious than true, that Abraſax is compounded of two Greek words, of which he makes ἀβρος and σαω, or σὺ, the other; and ſo proves the meaning of it to be the *beautiful*, or the *magnificent Saviour*, and applies it to the ſun. Nothing has puzzled the learned more than the origin and ſignification of this enigmatical term: we ſhall preſent our readers with a few of their explanations, and then leave them to judge for themſelves. One ſays that Abraſax is compounded of the initial letters of ſeveral words, three Hebrew, and three Greek, in the following manner:

A	ſtands for Ab, the father
B	Ben, the ſon
R	Rouach, the ſpirit
A	Acadoſch, holy
S	Soberia, ſalvation
A	Apo, by
X	Xulou, the tree, or wood.

This it muſt be confeſſed is a very orthodox explanation, but ſo wild and improbable, that it could

never have entered into any one's head, except that of an eccleſiaſtic viſionary. Another writer, who adopts the plan above, and improves upon it, thinks that the letters A. S. A. X. ſtand for ανθρωπος σωσαν αγιω ξυλω. There is another different account of it given by M. Baſnage, in his Hiſtory of the Jews. He aſſerts, that the word Abraſax took its origin from the Egyptians; becauſe there are a great number of amulets to be found, on which is an Harpocrates, the Egyptian God of Silence, ſitting on the lotus, and the ſcourge in his hand, with the word Abraſax. This is certainly a true account of it: for the word, Abracadabra, which is recommended as a charm by Serenus Simonicus, who was a follower of Baſilides, is evidently taken from Abraſax.

ABREAST, in naval affairs. On the different occaſions of attack, purſuit, or retreat at ſea, the ſquadrons or diviſions of a fleet are often obliged to vary their diſpoſitions, and yet obſerve a proper regularity, by ſailing in right or curved lines: when they ſail at a proper diſtance from each other, and are all equally forward, they are then ſaid to have formed the line abreaſt, the commander in chief being ſtationed in the center; and the ſecond and third in command, if there be any, in the center of their diviſions, on each wing; there being no van or rear in the manœuvre. See LINE *ahead*.

ABRIDGING, the ſhortening or contracting any book, writing, &c.

ABRIDGING, in algebra, is reducing a compound equation to a more ſimple form. See EQUATION.

ABRIDGMENT, an abſtract or epitome of a larger work.

Critics and ſtudents, who are commonly the greateſt enemies to abridgments, pretend, that the cuſtom of making them was not introduced till a long time after thoſe happy ages when the arts and ſciences flouriſhed in Greece. In their opinion, abridgments were the firſt fruits of idleneſs, when thoſe times which ſucceeded the fall of the empire were ſhrouded in the darkneſs of barbariſm. Men of learning, ſay they, then only endeavoured to ſhorten their labours and ſtudies, eſpecially in reading the hiſtorians, philoſophers, and lawyers, either for want of leiſure or courage to peruſe the originals.

Some authors have thought, that ſeveral of the books of the Old Teſtament are only abridgments of the books of Gad, Iddo, and Nathan, of the writings of Solomon, the Chronicles of the kings of Judah, &c. The lawyers complain, they owe to this artifice the loſs of above two thouſand volumes of the firſt writers in their profeſſion, as Popinian, the three Scævolas, Labenus, Ulpian, Modeſtinus, and ſeveral others, whoſe names are well known. By the ſame means a great number of the works of the Greek fathers, from Origen or Irenæus, down to the time of the ſchiſms and diviſions of the church, have periſhed: during which period a great variety of authors wrote upon the books of Scripture. The extracts which Conſtantinus Porphyrogenitus made from ſeveral excellent Greek and Latin hiſtorians, relating to hiſtory, politics, and morality, tho' in other reſpects highly commendable, have occaſioned the loſs of the univerſal hiſtory of Nicholas of Damaſcus, great part of the books of Polybius, Diodorus Siculus, Dionyſius Halicarnaſſus, &c. Nor have we any room to doubt but that Juſtin has occaſioned the loſs of the entire hiſtory of Trogus Pompeius, by the abridgment he made of that work; and it may juſtly be ſaid, that the ſame thing has happened in all other branches of literature.

It may, however, be alledged in favour of abridgments, that they are convenient for ſuch as have neither leiſure to conſult the originals, ability to procure them, nor talents to underſtand them thoroughly. Beſides, Salmaſius has remarked, that the moſt excellent works, both among the Greeks and Romans, would infallibly have periſhed in the times of barbariſm, had it not been for the induſtry of the authors of theſe abridgments, who have, at leaſt, ſaved us ſome planks out of the general ſhipwreck, and no ways prevent our conſulting the originals whenever they can be found.

ABRIDGMENT, in law, implies the ſhortening a plaint or declaration.

ABROGATION, ſignifies the repealing and aboliſhing a law.

ABROTANUM, ſouthernwood, in botany. See the article SOUTHERNWOOD.

ABRUS, American bitter-vetch, called glicine by Linnæus, a kind of kidney-bean, growing in the Eaſt and Weſt-Indies, in Egypt, and other parts of the world.

It is uſed in the Eaſt and Weſt-Indies, with the ſame intention as liquorice, and increaſed by ſeeds ſown in the ſpring; but being a tender plant, it requires a hot-houſe in this climate.

ABSCESS, in ſurgery, an inflammatory tumour, containing purulent matter, pent up in a fleſhy part.

An abſceſs is always the effect of an inflammation, which may frequently be diſcuſſed without coming to a ſuppuration, or before the abſceſs is formed.

But when the proper remedies to diſperſe the humour have been too long neglected, or uſed in vain, the utmoſt expedition ſhould be uſed to bring the humour to maturation. The proper medicines for promoting this intention are ſuch as increaſe the motion in the part, and have a tendency to create a gentle fever; ſuch as fomentations, and ſtimulating medicines. Such compoſitions alſo as confine the heat excited in the part affected, by

preventing an exceſſive perſpiration, are alſo proper. The ſimple aromatic gums, and the emollient, relaxing, and moiſtening medicines, are therefore proper for maturating the pus.

This method muſt be purſued till the abſceſs has acquired a ſufficient degree of ripeneſs, which may be known by the ſoftneſs of the part, and the fluctuation of the tumour when preſſed; its whiteneſs, the remiſſion of the pain, heat, redneſs, tenſion, pulſation, and fever; the pointed apex of the tumour, and a ſenſe of weight ſucceeding the pain, are likewiſe ſigns that the pus is already formed, and fit for evacuation.

When theſe ſigns indicate the maturity of the tumour, the knife is to be introduced into its inferior, ſofteſt, whiteſt, and moſt prominent part, till the pus flowing out evinces that a ſufficient penetration is made: then let the knife be raiſed equably upwards, ſo as to make a large inciſion; or forcing its point through the oppoſite part of the abſceſs, let the intermediate integuments be divided, taking care to avoid the fibres and veſſels.

Then let the ulcer be cured by cleanſing, ſuppurating, digeſtive, deterſive, and drying medicines, which muſt be varied according to the ſtate of the part. See the article WOUND.

If the patient be afraid of an inciſion, let a cauſtic be applied to the part, the eſcar ſeparated, and the cure performed, in the ſame manner as before.

ABSCISSE, or ABSCISSA, in conic ſections. See PARABOLA, ELLIPSIS, and HYPERBOLA.

ABSCISSION, in rhetoric, a figure of ſpeech, whereby the ſpeaker ſtops ſhort in the middle of his diſcourſe, leaving the hearer to draw what concluſion he pleaſes.

ABSINTHIUM, wormwood, in botany. See the article WORMWOOD.

ABSIS, in aſtronomy, the ſame with apſis. See APSIS.

ABSOLUTE, in a general ſenſe, denotes ſomething that is unconnected with, or independant on another.

ABSOLUTE, is alſo an epithet applied to things which are free from limitation, or condition.

ABSOLUTE *Equation*, in aſtronomy. See EQUATION.

ABSOLUTE *Number*, in algebra. See NUMBER.

ABSOLUTE *Motion*, ABSOLUTE *Space*, ABSOLUTE *Time*, } See { MOTION. SPACE. TIME.

ABSOLUTION, a term ſynonimous with pardon or forgiveneſs.

Pardon is in conſequence of an offence committed, and relates principally to the offender; it depends upon the party offended, and produces a reconciliation when it is ſincerely aſked, and ſincerely granted. Forgiveneſs is in conſequence of a crime, and has a particular relation to the puniſhment which the crime deſerves: it is granted either by a prince or a magiſtrate, and arreſts the uplifted arm of juſtice.

Abſolution therefore is in conſequence of an offence or crime, and properly concerns the ſtate of the guilty: it is pronounced either by the civil judge or the eccleſiaſtical miniſter, and reinſtates the accuſed, or the penitent, in the rights of innocence.

ABSOLUTION, in law, is a ſentence whereby the party accuſed is declared innocent, and conſequently ſaved from the puniſhment inflicted by the laws, for the commiſſion of the particular crime or offence with which he is charged.

The general method of trial, whether the accuſed were guilty or innocent, among the Romans, was generally this: After the cauſe had been pleaded on both ſides, the prætor pronounced aloud the word *dixerunt*, the parties have ſaid what they have ſaid, or what they have to ſay. Then three billets were immediately diſtributed to each judge, one marked with the letter A. for abſolution, another with C. for condemnation, and the third with N. L. for *non liquet*, it is not clear, to require a reſpite of judgment; and accordingly as there was a majority of this or that mark, the accuſed was abſolved, condemned, or reſpited. When the votes were equally divided on the ſides of abſolution and condemnation, the accuſed was abſolved, from a maxim ſuppoſed to be founded on the law of nature.

At Athens the practice was different; criminal cauſes were carried before the Helicæa, or the tribunal of judges called Heliaſtæ, from ἥλιος, the ſun, becauſe they held their aſſemblies in a place uncovered. When ſummoned by the Theſmothetes, they aſſembled in a large number, ſometimes amounting to fifteen hundred, and gave their ſuffrages in the following manner: A large veſſel covered with wicker was placed in the middle of the aſſembly, and on it two urns, one of copper and the other of wood; in the lids of thoſe urns was a long but narrow aperture, in the form of a parallelogram or long ſquare. The wooden urn was called κυρβις, being that into which the judges caſt the ſuffrages for condemning the accuſed; while that of copper was named ἀξονες, and received the ſuffrages of abſolution.

As ſoon as the cauſe had been pleaded, two pieces of copper were diſtributed to each of thoſe magiſtrates, the one plain, and the other with a hole in it; the former implied abſolution, and the latter condemnation; and according to the majority of pieces found in the one or the other of theſe urns, the party accuſed was abſolved or condemned.

ABSOLUTION, in the canon law, implies the miniſterial power of remitting ſins, veſted by Chriſt in the apoſtles, and from them derived to the church.

This

This is all that the primitive church ever pretended to, leaving the abſolute, ſovereign, independent, irreverſible power of abſolution to God alone.

The ancients enumerated five kinds of abſolution: 1. Baptiſm. 2. The eucharift. 3. The word and doctrine. 4. The impoſition of hands and prayer. 5. The reconcilement to the communion of the church, by a relaxation of her cenſures.

The two firſt may be called ſacramental; the third declaratory; the fourth precatory; and the fifth judicial. The firſt had no relation to penitential diſcipline, being never given to perſons who had once received baptiſm. The ſecond had ſome relation, but did not ſolely belong to it; for it was given to all baptized perſons in general, whether they had ever fell under penitential diſcipline or not: and in both caſes was called το τελειον, the perfection or conſummation of a Chriſtian. By the third, the miniſters of the church made public declaration to men of the terms of reconciliation and ſalvation. The fourth was uſed as a concomitant of moſt other abſolutions: and by the fifth penitents were finally reſtored to the peace and full communion of the church.

But during the firſt ages of the church, the form of abſolution always run in this manner, *Chriſt abſolve thee*; the indicative form, *I abſolve you*, having never been heard of till the twefth century, a little before the time of Thomas Aquinas, who was the firſt perſon that wrote in defence of it.

The judicious Hooker, ſpeaking of the abuſe of abſolution in the Romiſh church, ſays, "They "ſtrangely hold, that whatſoever the penitent "doth, his contrition, confeſſion, and ſatisfaction, "have no place of right to ſtand as material parts "of this ſacrament, nor conſequently any ſuch "force as to make them available for the taking "away of ſin, in that they proceed from the pe"nitent himſelf, without the privity of the mi"niſter, but only as they are enjoined by the mi"niſter's authority and power: — except there"fore the prieſt be willing, God hath by promiſe "hampered himſelf ſo, that it is not now in his "own power to pardon any man: — he hath no "anſwer to make but ſuch as that of the angel to "Lot, I can do nothing." This able writer then deſcribes the true nature and effects of abſolution, and adds, "The ſentence therefore of "miniſterial abſolution hath two effects: touch"ing ſin, it only declareth us freed from the "guiltineſs thereof, and reſtored unto God's fa"vour; but concerning right in ſacred and di"vine myſteries, whereof through ſin we are made "unworthy, as the power of the church did be"fore effectually bind and retain us from acceſs "unto them; ſo, upon our apparent repentance, "it truly reſtoreth our liberty, looſeth the chains "wherewith we were tied, remitteth all whatſo"ever is paſt, and accepteth us no leſs returned, "than if we had never gone aſtray."

ABSORBENT *Veſſels*, in anatomy, are thoſe which abſorb the fluids of the body. Thus the lacteals, whoſe mouths open into the inteſtines, and imbibe the nutritious juice, are called by this name. The pores diffuſed over the whole body are ſometimes alſo ſtiled abſorbent veſſels, becauſe they imbibe the air, effluvia, &c.

ABSORBENT *Medicines*, among phyſicians, are ſuch as have the property of drying up the redundant humours, whether taken inwardly, or applied externally to ulcers, &c.

All the teſtaceous powders, boles, chalk, calcined bones, magneſia alba, &c. are eſteemed powerful abſorbents.

ABSORPTION, in the animal œconomy, implies the act whereby the open orifices of the veſſels imbibe the juices they meet with in the cavities of the body.

ABSTEMIOUS, an epithet applied to perſons who uſe great temperance both in eating and drinking, eſpecially thoſe who abſtain from wine.

The word is Latin, *abſtemius*, and compounded of *abs*, from, and *temetum*, wine.

ABSTERGENTS, in the materia medica, are remedies of a ſaponaceous nature, capable of diſſolving reſinous concretions. Caſtellus has confounded them with abluents.

ABSTINENCE, *abſtinentia*, the refraining from ſomething we have a propenſity to, or in the enjoyment of which we find ſatisfaction.

Several are of opinion, that mankind before the flood abſtained from fleſh and wine, becauſe the Scriptures expreſly mention, that Noah, after the Deluge, began to plant the vine, and that God permitted him to uſe the fleſh of animals for food; whereas he had given Adam only the fruits and plants of the earth for his ſuſtenance. There are however many learned interpreters who maintain the contrary, and believe, that mankind before the Deluge did not deny themſelves the pleaſures of either wine or animal food. Indeed the Scriptures themſelves aſſure us, that all fleſh had corrupted his way; and therefore tho' the Almighty did not allow Adam to uſe either fleſh or wine, his impious deſcendants gave themſelves little trouble to obſerve the prohibitions of their Maker.

The prieſts among the Jews were commanded by the law to abſtain from wine during the whole time they were engaged in the ſervice of the temple; and the ſame prohibition extended to the Nazarites, as long as they continued ſuch.

The ancient athletæ obſerved a perpetual abſtinence from all kind of ſenſual pleaſures, in order to render their bodies more hardy and robuſt.

When Orpheus had ſoftened the manners of men, he eſtabliſhed a kind of life ſince called the Orphic;

Orphic; one of the chief tenets of which was, not to eat the flesh of animals. In all probability, Orpheus, after making the first people sensible of the laws of society, restrained them from eating meat, in order to wean them entirely from their primitive fierceness: and this practice being afterwards adopted by such as were desirous of leading a more perfect life than others, the ancients called it Ορφικος βιος, the Orphic life, which is mentioned by Plato in his Epinomis, and in the sixth book of his Laws.

The Phenicians and Assyrians, who were neighbours to the Jews, had their sacred fasts. The Egyptians, according to Herodotus, sacrificed a cow to Isis, after they had prepared themselves by fasting; and he attributes the same custom to the women of Cyrene. Among the Athenians, the Eleusinian mysteries, as well as the Thesmophores, were attended with rigorous fastings, especially among the women, who passed a whole day sitting on the ground in a mourning habit, and without taking any sustenance. They had also settled fasts at Rome, in honour of Jupiter; and historians also mention those of Julius Cæsar, Augustus, Vespasian, Marcus Aurelius, &c.

The Pythagoreans, or at least those among them who professed the greatest perfection, and valued themselves for having attained to the greatest degree of their master's theory, never tasted either flesh or fish. This abstinence from whatever had life, was a consequence of the metempsychosis; tho' it is difficult to say from whence Pythagoras imbibed the aversion he had to beans, mallows, wine, &c.

Abstinence, in medicine, has a very extensive signification: for by this word we understand a refraining from all succulent aliments.

Tho' abstinence is not sufficient to cure diseases, yet it greatly assists the operation of the medicines, and is a preservative against many disorders, especially those which result from gluttony.

We ought to regulate the quantity of aliments we take, according to the loss of substance we sustain by means of exercise, and the time during which perspiration is more or less plentiful; and also to abstain from such aliments as we have observed to disagree with our constitution.

The kinds of abstinence to which we ought to confine ourselves, both in sickness and health, should be regulated by the laws of diet and regimen. See the article Regimen.

Several writers relate wonders of the effects of abstinence in the cure of many disorders, and in protracting the time of life. The noble Venetian Cornaro, after every method had proved in vain, so that his life was despaired of at forty, recovered, and lived to near an hundred, merely by abstinence.

It is indeed surprising, to what a great age the primitive Christians of the east, who retired from the persecution into the deserts of Arabia and Egypt, lived, healthy and chearful, on a very little food. Cassian assures us, that the common quantity for twenty-four hours was twelve ounces of bread, and mere water; and that St. Anthony, on that portion only, lived to the age of an hundred and five years; James the hermit, an hundred and four; Arsenius, tutor to the emperor Arcadius, an hundred and twenty; St. Epiphanius an hundred and fifteen; Simeon the Stylite, an hundred and twelve; and Romauld, an hundred and twenty.

We can indeed equal, nay even excel, these instances of longævity, from the same cause, at home. Buchanan tells us, that one Laurence preserved his life to an hundred and forty, by the mere force of temperance and labour; and Spotswood mentions one Kentigern, who lived to an hundred and eighty-five by the same means. See Longævity.

Most of the chronical diseases, the infirmities of old age, and the untimely deaths of Englishmen, are, according to Dr. Cheyne, owing to repletion, and may be prevented by abstinence.

Among the brute creation, we see extraordinary instances of long abstinence. It is natural for various species to pass four, five, or six months every year, without either eating or drinking. The tortoise, dormouse, serpent, &c. are observed to retire regularly, at certain seasons, to their respective cells, and there hide themselves; some get into the caverns of rocks, or ruins; some dig holes under ground; some retire to the woods, and lay themselves up in the clefts of trees; and others bury themselves under water.

The serpent kind bear abstinence to a miracle. We have seen rattle-snakes that have subsisted many months without food, and still retained their vigour and fierceness. Dr. Shaw mentions, in his travels, a couple of cerastes, a sort of Egyptian serpent, which had been kept five years in a bottle close corked, without any sort of food, unless a small quantity of sand, wherein they had coiled themselves up in the bottom of the vessel, may be reckoned such; yet when he saw them, they had just cast their skins, and were as brisk and lively as if just taken. In short, several species of birds, almost the whole tribe of insects, and many among the other tribes, are able to subsist during the winter, without food, and many of them without respiration. This furnishes an admirable instance of the wisdom of the Creator: the proper food of these creatures, especially of the insect tribe, being then wanting, a provision is made for them to live without it. When the fields are divested of their flowery carpet, and the trees and plants are stripped of their fruits, what would become of such animals as subsist wholly on the produce of the spring and summer? and when the air is

grown rigid and chilly with the froſt, what would become of thoſe tender ſpecies, which are impatient of cold? To prevent the total deſtruction and extirpation of many ſpecies of animals, the author of nature has provided, that creatures thus bereaved of their food, ſhould be likewiſe impatient of cold, to lead them thus to ſhelter themſelves from danger; and that when arrived in a place of ſecurity, the natural texture and viſcidity of their blood ſhould diſpoſe it, by a farther degree of cold, to ſtagnate in the veſſels: ſo that the circulation ſtopping, and the animal functions being in a great meaſure ſuſpended, there is no ſenſible waſte or conſumption of parts, but they remain in a kind of drowſy neutral ſtate, between life and death, till the warm ſun revives both them and their food together, but thawing at once their congealed juices and thoſe of the vegetables on which they feed. The ſleep of ſuch animals is but very little different from death, and their waking from a reſurrection; for if life doth not conſiſt in a circulation of the blood, we know not in what it does conſiſt.

Hence it is no wonder that tortoiſes, dormice, &c. are found as fat and fleſhy, after ſome months abſtinence, as before. Sir George Ent weighed his tortoiſe ſeveral years ſucceſſively, at its going to earth in October, and its coming out again in March, and found that out of four pounds four ounces, it only uſed to loſe about one ounce. Nor are there wanting inſtances of men who have paſſed ſeveral months in as ſtrict abſtinence as other creatures. The records of the Tower mention a Scotſman impriſoned for felony, and ſtrictly watched in that fortreſs for ſix weeks, during which interval he had not the leaſt ſuſtenance of any kind, and on that account obtained his pardon. The German Ephimerides ſpeak of a woman called Martha Taylor, who, from a blow on the back, loſt her appetite to ſuch a degree, that the only ſuſtenance ſhe took during thirteen months, was only a few drops from a feather. This was indeed a morbid and unnatural caſe, for ſhe ſlept very little during the whole interval.

We may add the inſtance of S. Chilton of Tinſbury, near Bath, who, in the years 1693, 1694, and 1695, ſlept ſometimes four months, and ſometimes above ſix together, with very little food, and ſix weeks with nothing more than a ſmall quantity of tent, conveyed with a quill into his mouth, through a hole in his teeth.

It is added, that in moſt of the inſtances of long abſtinences related by naturaliſts, there were apparent marks that the texture of the blood was ſimilar to that of ſummer beaſts and inſects. It is indeed no improbable opinion, that the air itſelf may furniſh ſome kind of nutriment; for it is certain there are ſubſtances of all kinds, animal, vegetable, &c. floating in the atmoſphere, which muſt be continually taken in by reſpiration.

ABSTINENTS, a name given to a ſect of Heretics, who ſprang up in France and Spain, at the end of the third century, when the Chriſtians were perſecuted by Diocleſian and Maximian. They were a kind of Gnoſtics, or Manicheans: they decried marriage, condemned the uſe of meats, as if created by the Devil, and degraded the Holy Spirit into the claſs of created Beings.

ABSTRACT *Idea*, among logicians, implies the idea of ſome general quality or property conſidered ſimply in itſelf, without any regard to a particular ſubject: thus magnitude, equity, &c. are abſtract ideas, when we conſider them as detached from any particular body or perſon.

Abſtract ideas are of two kinds, abſolute and relative. The former contain general and univerſal conceptions of things conſidered in themſelves, as being, eſſence, exiſtence, act, power, ſubſtance, mode, &c. The latter compare ſeveral things, and conſider merely the relations of one thing to another, without conſidering whether the ſubjects of thoſe relations be corporal or ſpiritual; ſuch are our ideas of cauſe, effect, likeneſs, unlikeneſs, ſubject, object, identity, &c.

All things that exiſt, ſays Mr. Locke, being particulars, it may perhaps be thought reaſonable, that words, which ought to be conformable to things, ſhould be ſo too: but we find it quite the contrary; for moſt words in all languages are general terms; nor has this been the effect of neglect or chance, but of reaſon and neceſſity.

But ſince all things that exiſt are only particular, how came we by general terms? or where do we find thoſe general natures they are ſuppoſed to repreſent? Words become general, by being made the ſigns of general ideas: and ideas become general, by ſeparating from them the circumſtances of time, place, and other ideas that may determine them to that or this particular exiſtence. By this method of abſtraction they are rendered capable of repreſenting more individuals than one, each of which having a conformity to that abſtract idea, is of that ſort.

But it may not be amiſs to trace our notions and names from their beginning, and obſerve by what degrees we proceed from our infancy, and enlarge our ideas to general ones. It is evident, that the firſt ideas children acquire are only particular, as that of nurſe or mother, and the names they give them are confined to thoſe individuals; afterwards obſerving, by time and acquaintance, that there are a great many other things in the world that reſemble them in ſome common agreement of ſhape and other qualities, they frame an idea which they find thoſe many particulars include; to this idea they give, with others, the name man, for example; in this they make nothing

thing new, but only leave out of the complex idea they had of Peter, John, &c. that which is peculiar to each, and retain only what is common to all; and thus they acquire a general name, and a general idea. By the ſame method they advance to more general names and notions; for obſerving ſeveral things that differ from their idea of man, and cannot therefore be comprehended under that name to agree with man in ſome certain qualities; and uniting them into one idea, they have another more general idea, to which giving a name, they make it of a more comprehenſive and extenſive nature; thus, by leaving out the ſhape, and ſome other proportions ſignified by the name man, and retaining only a body with life, ſenſe, and a ſpontaneous motion, they form the idea ſignified by the name animal. By the ſame way they proceed to body, ſubſtance, and at laſt to being, thing, and ſuch univerſal terms, which ſtand for any ideas whatſoever.

Abſtract ideas are not however ſo obvious or eaſy to children, or the yet unexerciſed mind as particular ones. If they ſeem ſo to men, it is only becauſe they are rendered ſo by conſtant and familiar uſe: For when we attentively reflect upon them, we ſhall find that general ideas are fictions and contrivances, that carry difficulties with them, and do not ſo eaſily offer themſelves as we are apt to imagine. Does it not, for example, require ſome pains and ſkill to form the general idea of a triangle; ſince it muſt be neither oblique nor rectangular, neither equilateral nor ſcalenon, but all, and none of theſe at once. In effect, it is ſomething imperfect, which cannot exiſt, an idea wherein ſome parts of ſeveral different and inconſiſtent ideas are put together. It is true the mind, in this imperfect ſtate, has need of ſuch ideas, and haſtens to them for the conveniency of communication and enlargement of knowledge, to which it is naturally very much inclined. There is however reaſon to ſuſpect that ſuch ideas are marks of our imperfection, at leaſt that the moſt abſtract ideas are not thoſe which the mind is firſt and moſt eaſily acquainted with.

In the next place, it muſt be conſidered what is the proper ſignification of general words. It is evident they do not barely ſignify one particular thing; for then inſtead of being general terms, they would be proper names: neither do they ſignify a plurality, for then man and men would ſignify the ſame. General words therefore ſignify a ſort or ſpecies of things; and conſequently the eſſences of the ſort or ſpecies of things, are nothing elſe but abſtract ideas. The meaſure, or boundary, of each ſort, or ſpecies, whereby it is conſtituted that particular ſort, and diſtinguiſhed from others, is what we call eſſence, which is nothing but that abſtract idea to which the name is annexed; whence it is eaſy to obſerve, that the eſſences of the ſpecies of things, and conſequently the ſorting of things, is the workmanſhip of the underſtanding that abſtracts and makes thoſe general ideas.

Theſe eſſences or abſtract ideas are diſtinct ſpecies. Thus a circle is as eſſentially different from an oval, as a ſheep from a goat; and rain is as eſſentially different from ſnow, as water from earth; that abſtract idea, which is the eſſence of the one, being impoſſible to be communicated to the other. And thus any two abſtract ideas, that in any part vary from one another, with two diſtinct names annexed to them, conſtitute two diſtinct ſorts, or, if you pleaſe, ſpecies, as eſſentially different, as any two the moſt remote or oppoſite in the world. Propoſitions concerning any abſtract ideas, that are once true, muſt needs be eternal verities.

Such is the excellent Mr. Locke's account of abſtract ideas, and it is now generally allowed, that the mind has the power or faculty of forming abſtract ideas, or general notions of things. The late learned Dr. Berkley has however called this doctrine in queſtion. "I will not affirm, ſays "that ingenious writer, that other people have not "this wonderful faculty of abſtracting their ideas; "but I am confident I have it not myſelf. I "have indeed a faculty of imagining or repreſent-"ing to myſelf the ideas of thoſe particular "things I have perceived, and of variouſly com-"pounding or dividing them. I can imagine a "man with two heads, or the upper parts of a "man joined to the body of a horſe. I can con-"ſider the hand, the eye, the noſe, each by it-"ſelf abſtracted, or ſeparated from the reſt of "the body; but then, whatever hand or eye I "imagine, it muſt have ſome particular ſhape and "colour. So likewiſe the idea of a man, that I "frame to myſelf, muſt be either a white, or a "black, or a tawny, a ſtrait, or a crooked, a "tall, or a low, or a middle-ſized man. I can-"not by any effort of thought conceive, the ab-"ſtract idea of a triangle above deſcribed; and it "is equally impoſſible for me to form the abſtract "idea of motion, diſtinct from the body moving, "and which is neither ſwift nor ſlow, curvilinear, "nor rectilinear; and the ſame may be ſaid of all "other abſtract general ideas whatſoever."

Words, according to Mr. Locke, become general by being made the ſigns of general ideas. But Dr. Berkley ſays, words become general by being made the ſign, not of an abſtract general idea, but of ſeveral particular ideas, any one of which it indifferently ſuggeſts to the mind. Thus, when it is ſaid, for example, "The change of motion is pro-"portional to the impreſſed force;" or, "What-"ever has extent is diviſible;" the propoſitions are to be underſtood of motion and extenſion in general; but it will not therefore follow, that they ſuggeſt to my thoughts an idea of motion without a moving body, or any determinate direction, velocity,

ocity, &c. or that we muſt conceive an abſtract general idea of extenſion, which is neither line, ſurface, nor ſolid; nor great, nor ſmall, black, white, nor red, &c. It only implies that whatever motion we conſider, whether it be ſwift or ſlow, perpendicular, horizontal, or oblique, or in whatever object, the axiom concerning it holds equally true; as does the other of any particular extenſion, it matters not whether it be a line, ſurface, or ſolid, whether of this or that magnitude, figure, &c.

ABSTRACT *Terms*, in logic, are ſuch as denote thoſe objects which exiſt only in the imagination. Thus beauty and uglineſs are abſtract terms.

There are ſome objects that pleaſe and appear agreeable to us; whereas, on the contrary, there are others that affect us in a very diſagreeable manner: the former we call beautiful, and the latter ugly; and yet there are no ſuch real ſubſtances in nature, as beauty and uglineſs: they ſubſiſt in our imagination only.

ABSTRACT, or pure *Mathematics*, are thoſe branches which treat of magnitude, or quantity, conſidered abſolutely, and in general, without reſtriction to a particular part. Geometry, Algebra, and Arithmetic, are therefore abſtract Mathematics.

ABSTRACT *Numbers*, are aſſemblages of units conſidered in themſelves, and not applied to denote any collections of particular and determined things. Thus, 5. is an abſtract number if conſidered ſimply in itſelf; but if we ſay 5 feet, or 5 pounds, then 5 becomes a concrete number.

ABSTRACTION, an operation of the mind, whereby we ſeparate things naturally connected together, and conſider each ſingle relation, or property of the ſubject ſingly by itſelf.

This operation is performed three ways: 1. The human mind can conſider any one part of a thing, as really diſtinct from it; as the arm, without conſidering the reſt of the body. 2. The mind can, by abſtraction, conſider the mode of a ſubſtance, omitting the ſubſtance itſelf; or conſider ſeparately the different modes, which exiſt together in the ſame ſubject. This ſpecies of abſtraction is uſed by geometricians, when they conſider the length of a body ſeparately, and which they call a line, omitting the conſideration of its breadth and depth; and then its length and breadth together, which they call a ſurface. By the ſame ſpecies of abſtraction, we can diſtinguiſh the determination of a motion towards whatever place directed, from the motion itſelf. 3. By abſtraction we omit the modes and relations of any particular things, in order to form an univerſal idea.

It is this faculty, or power of abſtraction that makes the great difference between man and brutes. The latter ſeem to reaſon about particular objects and ideas; but there does not appear in them, the leaſt indication of abſtraction.

ABSTRACTIONS, among chemiſts, imply the native ſpirits of aromatic vegetables, to diſtinguiſh them from ſpirits produced by fermentation.

ABSTRUSE, ſomething deep, hidden, or far removed from the common apprehenſion, and methods of conceiving; in oppoſition to what is obvious and palpable.

The word is Latin, *abſtruſus*, and compounded of *abs*, from and *trudo*, to thruſt.

ABSURD, an epithet which is applied to any thing that contradicts reaſon, or the evidence of one's ſenſes. It is too often made uſe of in religious controverſies, when a point is diſcuſſed that is *above* human comprehenſion: but in ſuch caſes improperly; for though it would be abſurd to affirm that four and five make only three, or that two and one are equal to nine, as claſhing with a ſelf-evident propoſition; yet in religious matters, that are above the reach of human reaſon, it ſhould never be applied, as the mind is too narrow to comprehend every thing that *may be*.

ABSURDITY, a kind of error or offence againſt ſome evident, and generally received truth or principle. The greateſt of all abſurdities is the *contradiction*. See CONTRADICTION.

ABSURDITY, in behaviour, ſignifies the very contrary of wit. It is next to that, of all things in the world, the moſt proper to excite mirth. What is fooliſh, is the object of pity; but abſurdity, generally proceeds from an opinion of ſufficiency, and conſequently is an honeſt occaſion for laughter.

ABUNDANCE, in mythology. See the article PLENTY.

ABUNDANT *Numbers*, with arithmeticians, are ſuch whoſe aliquot parts added together is greater than the number itſelf, as 20, whoſe aliquot parts are 1, 2, 4, 5, 10, and make 22. See ALIQUOT, and NUMBER.

ABUSE, in a general ſenſe, implies the perverting ſomething from its true deſign, purpoſe, or intention.

The word is Latin, *abuſus*, aud compounded of *ab*, from and *uſus*, uſe, q. d. contrary to the true uſe.

ABUSE *of words*, implies the uſing words without any clear and diſtinct ideas; or, ſometimes, without any idea at all.

Language being the conduit, whereby men convey their diſcoveries, reaſonings, and knowledge, from one to another; he that makes an ill uſe of it, though he does not corrupt the fountains of knowledge, which are in the things themſelves; yet he does, as much as in him lies, to break or ſtop the pipes whereby it is diſtributed for the public uſe and advantage of mankind: and may

be looked upon as an enemy to truth and knowledge.

For as we are let into the knowledge of things by words, ſo we are oftentimes led into error or miſtake by the abuſe of words; flowing from theſe two cauſes, viz. the natural and unavoidable imperfection of languages, and the wilful faults and neglects of men.

In order therefore to guard againſt ſuch miſtakes, as well as to promote our improvement in knowledge, it is neceſſary to acquaint ourſelves a little with the abuſe of words, which men are ſo often guilty of. 1. They uſe words without clear and diſtinct ideas; or, which is worſe, ſigns without any thing ſignified: inſtances of this kind may be eaſily had from the ſchoolmen and metaphyſicians. 2. Inconſtancy in the uſe of words; it being hard to find a diſcourſe on any ſubject, wherein the ſame words are not uſed ſometimes for one collection of ideas, and ſometimes for another. 3. An affected obſcurity, either by uſing old words in new ſignifications, or by introducing new and ambiguous terms, without defining them, or putting them together ſo as to confound their ordinary meaning. 4. The taking of words for things; though this in ſome degree concerns all names in general, yet it more particularly affects thoſe of ſubſtances. Thus in the Peripatetic philoſophy, ſubſtantial forms, abhorrences of vacuum, &c. are taken for ſomething real. 5. The ſetting them in the place of things, which they can by no means ſignify: thus we may obſerve, that in the general name of ſubſtances, whereof the nominal eſſences are only known to us, when we affirm or deny any thing about them; we do, very often, tacitly ſuppoſe, or intend, they ſhould ſtand for the real eſſences of a certain ſort of ſubſtances: but to ſuppoſe theſe names to ſtand for a thing, having a real eſſence on which the properties depend, is a plain abuſe; ſince we would make them ſtand for ſomething, which not being in our complex idea, the name we uſe can no ways be the ſign of.

He therefore that hath names without ideas, wants meaning in his words, and ſpeaks only empty ſounds: he that hath complex ideas without names for them, wants diſpatch in his expreſſions: he that uſes words looſely and unſteadily, will either not be minded, or not underſtood: he that applies his names to ideas different from their common uſe, wants propriety, and ſpeaks gibberiſh: and he that hath ideas of ſubſtances diſagreeing with the real exiſtence of things, ſo far wants the materials of true knowledge in his underſtanding, and has inſtead thereof chimeras.

To remedy the above-mentioned abuſes of ſpeech, the following rules may be of uſe:

1. A man ſhould take care to uſe no word without a ſignification; no name without an idea which he makes it ſtand for.

2. Thoſe ideas he annexes them to ſhould be clear and diſtinct, which, in complex ideas, is by knowing the particular ones that make that compoſition.

3. He muſt apply his words, as near as may be, to ſuch ideas as common uſe has annexed to them.

4. When common uſe hs left the ſignification of a word uncertain and looſe; or where it is to be uſed in a peculiar ſenſe; or where the term is liable to any doubtfulneſs or miſtake, there it ought to be defined, and its ſignification aſcertained.

5. The laſt rule is, that in all diſcourſes wherein one man pretends to inſtruct or convince another, he ſhould uſe the ſame word conſtantly in the ſame ſenſe; if this were conſtantly done (which no body can refuſe without great diſingenuity) many of the books extant might be ſpared; many of the controverſies in diſpute would be at an end; ſeveral of thoſe great volumes, ſwollen with ambiguous words, now uſed in one ſenſe, and by and by in another, would ſhrink into a very narrow compaſs. *Locke on Human Underſtanding.*

ABUTTALS, the boundaries of a piece of land.

ABUTILON, in botany, a plant of the mallow kind, bearing a flower, that conſiſts of five diſtinct petals; from the center of which ariſes a number of united filaments, whoſe tops are ornamented with round antheræ, and a ſhort ſingle ſtyle. When the flower is decayed, the fruit appears, containing a number of cells, each of which when open diſcovers a kidney-ſhaped ſeed. There are ſeveral varieties of theſe plants, ſome of which produce round ſeed; but moſt of the ſorts being natives of the Weſt Indies, require more heat than this climate can naturally afford them.

ABYSS, in a general ſenſe, ſignifies without a bottom: and is derived from the Greek ἀ, priv. βυσσὸς, a bottom.

In a particular ſenſe it means that immenſe cavern of the earth into which God collected all the waters on the third day, to ſerve as a reſervoir for the ſupply of his creatures. Dr. Woodward conjectures, that there is a mighty maſs of waters encloſed in the bowels of the earth, conſtituting a vaſt orb in the central parts of it; and over the ſurface of this water he imagines the terreſtrial ſtrata to be formed. This, according to him, is what Moſes calls the great deep, and what moſt authors render the great abyſs. He ſays, that the ſea has a communication with theſe waters, by means of chaſms in the earth: which conjecture appears not altogether groundleſs, as it would be difficult to account any other way for the vaſt influx of waters into ſeveral lakes, as well as into the Caſpian ſea, from which no efflux has ever yet been obſerved.

Abyss, in Scripture, ſignifies alſo hell, or that immenſe ſpace where, according to the opinion of the Jews, the giants are ſuffering the puniſhment of their ſins. It is there that the Rephaims, or ancient giants of Canaan, are bound, with all thoſe kings of Tyre, Babylon, and Egypt, whoſe pride and cruelties have been recorded in the Prophets.

Theſe abyſſes are the dreary and diſmal abode of the impious and unjuſt. "I ſaw," ſays St. John in the Revelations, "a ſtar fall from heaven unto "the earth: and to him was given the key of the "*bottomleſs pit*: that pit, where the ungodly *ſhall* "*ſeek death, and ſhall not find it*; *and ſhall deſire to* "*die, and death ſhall flee from them.*"

ACACIA, in botany, the Egyptian thorn. There are ſeveral ſorts of this genus of plants; but all claſſed by Dr. Linnæus with the *Mimoſa*, or ſenſitive plant. The principal difference between the acacia and mimoſa is, that the leaves of the acacia will not fall at the touch, whereas thoſe of the mimoſa will, ſo as to appear withered: the ſort which is beſt known by the name of the Egyptian thorn is very common in England, and produces a tree of a tolerable ſize; the leaves of which are placed oppoſite to each other in pairs; the flowers, which grow in bunches, conſiſt each of one leaf, ſlightly divided at the extremity into five parts; the filaments are hairy and longer than the ſtyle; from the flower a pod is produced which contains ſeveral flat oblong ſeeds. The branches of moſt of the ſorts are armed with ſtrong ſharp thorns. From this plant the gum arabic is taken.

Acacia *Germanica*, an inſpiſſated juice, made from wild ſloes before they are ripe.

ACACIANS, in eccleſiaſtical hiſtory, the name of ſeveral ſects of heretics; ſome of whom maintained, that the ſon was only of a ſimilar, not the ſame ſubſtance with the father; and others, that he was not only a diſtinct, but alſo of a diſſimilar ſubſtance.

ACADEMICS, a ſect of ancient philoſophers, the diſciples of Socrates and Plato, ſo called from Academe, which was a garden or villa near Athens, where Plato and Socrates uſed to converſe and diſpute on philoſophical ſubjects. The particular tenets advanced by theſe ſages were, that all knowledge is at beſt uncertainty, and that truth is difficult if not impoſſible to be attained. They did not however carry theſe opinions to that extravagant pitch which the Pyrrhonians did, who doubted of every thing, but confined them to phyſics. It is true, indeed, that Socrates profeſſed that he knew nothing; but it was partly through modeſty that he ſpoke thus, and partly to ridicule the pride and vanity of his brother philoſophers, who fooliſhly imagined there was nothing that they did not know. If we excuſe in the Academics this affectation of ignorance and diffidence of themſelves, we ſhall find little or nothing in their doctrines but what is pure and praiſe-worthy. The writings of Plato are full of wiſdom and truth; he taught, in the ſweeteſt and moſt eloquent ſtile, ſuch doctrines as ſeem to be beyond the reach of human wiſdom; which have occaſioned his being upbraided with plagiariſm, as if he had ſtolen them from the books of Moſes. It muſt be confeſſed, that it is difficult any other way to account for ſome parts of his ſublime knowledge; as that there is one infinite and eternal God, the father and creator of all things; that he made the world out of nothing, according to a certain exemplar or model in his own mind; that man was born of the earth; that he was naked; that he enjoyed a truly happy ſtate; with ſeveral points beſides, ſo abhorrent from the heathen, and agreeable to the Jewiſh philoſophy, that he got the name of the Attic Moſes.

Notwithſtanding Plato recommended to his diſciples a diffidence of themſelves, and inſtructed them to doubt of every thing; yet he ſeems to have done it in ſuch a manner as if he did not intend to leave them fluctuating between truth and error, but to put them upon their guard againſt raſh and precipitate deciſions, and teach them to accuſtom their minds to examine every thing freely and without prejudice, as being the only means of ſecuring themſelves from error. It were to be wiſhed that the ſame could be ſaid of thoſe who ſucceeded him in his philoſophy, namely Arceſilas, Carneades, Clitomachus, and Philo. But they ſeem to have carried his erroneous notions much higher; for they do not only affirm that we know nothing, but even that we do not know whether we know any thing.

We read of five different academies; the firſt under Socrates and Plato; the ſecond under Arceſilas; the third under Carneades; the fourth under Philo, the diſciple of Clitomachus; and the fifth founded by Antiſchus: but they ſeem rather to be branches of the ſame root, than ſo many different trees; unleſs indeed we except the fifth academy, in which the Stoic doctrines were dreſſed out in the old academic fur.

ACADEMY, a delicious garden or villa, within a mile of Athens, ſo called from one Academus, or Ecademus, a citizen of Athens, to whom it originally belonged. Plato tells us, that it was a kind of gymnaſium, or place of exerciſe, in the ſuburbs of that city, watered by a gentle ſpring, and ſurrounded with groves of olive and plantane. It was the favourite retreat of the philoſophers and ſages of Athens, but particularly of Socrates and Plato; for which reaſon the ſect founded by them was ſtiled academic. Milton gives us a beautiful deſcription of it in his Paradiſe Regained, Book iv. l. 244.

See there the olive grove of academic
Plato's retirement, where the Attic bird
Trills her thick warbled notes the ſummer long;
There flow'ry hill Hymettus with the ſound
Of bees induſtrious murmur oft invites
To ſtudious muſing; there Iliſſus rolls
His whiſpering ſtream. ——

Cicero had a villa, or place of retirement, near Puzzuoli, to which he gave the name of academy, where he uſed to entertain his friends with what the poet calls, "The feaſt of reaſon, and the flow of ſoul." It was there that he compoſed his *Academical Queſtions*, and his book *De Natura Deorum*.

ACADEMY, among the moderns, is generally uſed to ſignify a ſociety or company of men of letters, eſtabliſhed for the culture of the arts and ſciences.

Some authors have confounded the word academy with that of univerſity; and it is indeed ſometimes uſed for a ſchool, or place of inſtruction, where the arts and ſciences are taught. We have in England two royal academies of this kind, one at Woolwich, and the other at Portſmouth, beſides a great number of private ſchools called academies: but in the proper ſenſe of the words they are really different; the former implying a ſociety of learned men, who meet to confer and communicate their lights to one another, for their mutual benefit and the improvement of the arts; and the latter a body compoſed of graduates in the ſeveral faculties; of profeſſors who teach in the public ſchools; of regents or tutors, and of ſtudents who learn under them, and aſpire likewiſe to degrees. See the article UNIVERSITY.

Charlemagne has the honour of being the firſt that eſtabliſhed an academy in Europe. It was compoſed of the chief wits of the court, and the emperor himſelf was one of the members. In their academical conferences each perſon was to give an account of what ancient authors he had read, and each academician aſſumed the name either of ſome ancient writer, or ſome celebrated perſon of antiquity.

At preſent moſt nations have their academies, Ruſſia not excepted; but Italy excels in this reſpect, at leaſt in point of numbers. We have but few in England; the chief of which are the royal ſociety, the antiquarian ſociety, the ſociety for the encouragement of arts, and the academy of painting. See ROYAL *Society*, ANTIQUARIAN *Society*, and SOCIETY *for the Encouragement of Arts*. There is alſo a literary ſociety eſtabliſhed in Scotland. See EDINBURGH *Society*.

The French have ſeveral flouriſhing academies of all kinds, particularly the following:

French ACADEMY, a ſociety inſtituted in the year 1635, for perfecting the French language. They meet at the Old Louvre three times a week, during the whole year; but have no public aſſemblies, except thoſe in which they receive ſome new academician, and that which is held on St. Louis's day, when they diſtribute the prizes of eloquence and poetry, each of which conſiſts of a gold medal. They have already publiſhed a dictionary, intituled, *La Dictionnaire de l'Academie Françoiſe*. Their motto is, *A l'Immortalité*.

Royal ACADEMY *of Sciences* was founded at Paris in the year 1666, and confirmed by the king in 1699, for the improvement of phyſics, mathematics, and chemiſtry.

The academy at firſt conſiſted of ten honorary academicians; eight ſtrangers, aſſociates; twenty penſioners, fellows; twenty eleves, or ſcholars; and twelve French aſſociates.

But in the year 1696, the academy received a new regulation; by which it was compoſed of ten honorary members, twenty penſioners, three geometricians, three aſtronomers, three mechanics, three anatomiſts, three botaniſts, three chemiſts, a treaſurer, and a ſecretary, who are both perpetual; twenty aſſociates, twelve of whom muſt be inhabitants of France, and eight foreigners; and twenty eleves, each of whom muſt be attached to one of the penſioner academiſts.

In the year 1716, the duke of Orleans, then regent of the kingdom, thought proper to make ſome amendments to this regulation; and accordingly, the claſs of eleves was ſuppreſſed, it appearing to be attended with ſome inconveniences, particularly that of making too great an inequality among the acadamicians, and being productive of ſome animoſities among the members. At the ſame time he created two new claſſes, one conſiſting of twelve adjuncts, and the other of ſix free aſſociates.

Ever ſince the eſtabliſhment of this academy in the year 1699, they have been very exact in publiſhing every year a volume in quarto, containing either the works of its own members, or ſuch memoirs as have been compoſed and read to the academy during the courſe of the year. To each volume is prefixed the hiſtory of the academy, or an extract of the memoirs, and, in general, of whatever has been read or ſaid in the academy: at the end of the hiſtory are the eulogies of ſuch academiſts as have died during the courſe of that year.

The late Mr. Rouillé de Meſlay, counſellor to the parliament of Paris, founded two prizes, one of two thouſand five hundred livres, and the other of two thouſand, which are diſtributed alternately by the academy every year; the ſubjects for the firſt muſt relate to phyſical aſtronomy, and thoſe for the latter to navigation and commerce.

The motto of this academy is, *Invenit & perfecit*.

Royal ACADEMY *of Inſcriptions and Belles Lettres*, was

was eſtabliſhed by Lewis XIV. In the year 1663, and ſoon after their inſtitution, they undertook to compoſe, by means of medals, a connected hiſtory of the principal events of that prince's reign.

In the year 1701, this academy received a new regulation; by which it was to conſiſt of ten honorary members, ten penſioners, ten aſſociates, and ten eleves; but the laſt have been ſince ſuppreſſed and united to the aſſociates. The ſecretary and treaſurer are both perpetual; and the academy have publiſhed ſeveral volumes, which contain, beſides the memoirs which are thought proper to appear intire, extracts made by the ſecretary from ſeveral others, together with the eulogies of the deceaſed members. The academy diſtributes every year a gold medal of four hundred livres value, as a literary prize founded by M. Darcy de Noinville, Their motto is, *Vetat mori.*

Royal ACADEMY *of Sciences and Belles Lettres of Pruſſia*, a flouriſhing academy eſtabliſhed at Berlin in the year 1700, by Frederic I. King of Pruſſia. This academy has publiſhed ſeveral volumes of memoirs, containing ſeveral curious and uſeful papers in various arts and ſciences.

Imperial ACADEMY *of Peterſburg*, a ſociety of learned men, eſtabliſhed at Peterſburg in the year 1726, by the Czarina Catharine; ſince which time they have publiſhed thirteen volumes of memoirs wrote in Latin, ſeveral parts of which, eſpecially the mathematical papers, are very valuable. The motto of this academy is, *Paulatim.*

Royal Spaniſh ACADEMY is an academy for cultivating the Caſtilian tongue, eſtabliſhed at Madrid on the model of the French academy. The deſign of this ſociety was laid by the duke d'Eſcalona, and approved of by the king in 1714, who declared himſelf its protector. It conſiſts of twenty-four academiſts, including the director and ſecretary. Its device is a crucible on the fire, with this motto, *Limpia fija y da eſplendor.*

ACADEMY *of Naturæ Curioſi*, in Germany, was firſt founded in 1652, by Mr. Bauſch, a phyſician, and taken, in 1670, under the protection of the emperor Leopold.

Italy alone has more academies of note than all the reſt of the world; not a city but furniſhes a ſet of learned perſons for an academy, which to them ſeems an eſſential part of a regular conſtitution. Jarckius has given us a ſpecimen of their hiſtory, printed at Leipſic in 1725.

Jarckius's account goes no farther than to the academies of Piedmont, Ferrara, and Milan; in which laſt city he reckons twenty-five; but adds a liſt of all the reſt, to the number of five hundred and fifty.

ACADEMY *of Painting*, is a public ſchool to which the painters reſort, either to draw, or paint, and where the ſculptors model after a naked perſon, which they call a model.

The royal academy of painting and ſculpture at Paris took its riſe from the diſputes that happened among the maſter-painters and ſculptors in that capital. This induced Le Brun, Sarazin, Corneille, and others of the king's painters, to form the deſign of a particular academy; and, having preſented a petition to the king, they obtained an arret, dated the 20th of January, 1648. Their meetings were at firſt held in the apartments of M. Charmois, ſecretary to the marſhal Schomberg, who drew up the firſt body of ſtatutes for the academy.

Afterwards the academy conferred in the houſe of a friend of M. Charmois, ſituate near St. Euſtachius's; from whence they removed to the hotel de Cliſſon, where they continued their exerciſes till the year 1653, when the academiſts removed into the ſtreet des Dechargeurs. In the year 1654, and towards the beginning of 1655, they obtained from cardinal Mazarine a brevet and letters patent, which were regiſtered in parliament; and, in grateful acknowlegement for this favour, they choſe the cardinal for their protector, and the chancellor for their vice-protector.

It is remarkable, that the chancellor had, from the firſt inſtitution of the academy, been named its protector; but, in order to make his court to cardinal Mazarine, he declined that title, and contented himſelf with that of vice-protector.

In the year 1656, Sarazin granted to the academy an apartment which he at that time had in the galleries of the Louvre; but they were obliged to quit it in the year 1661: and M. de Ratabon, ſuperintendant of the buildings, removed them to the Palais-royal, where they remained one and thirty years. At laſt the king gave them an apartment in the Old Louvre.

In the year 1663, the academy obtained, by means of M. Colbert, a penſion of 4000 livres.

This academy conſiſts of a protector, a vice-protector, a director, a chancellor, four rectors, adjuncts to the rectors, a treaſurer, forty profeſſors, one of which is profeſſor of anatomy, and another of geometry; ſeveral adjuncts and counſellors, a ſecretary and hiſtoriographer, and two uſhers.

The academy of painting holds a public aſſembly every day for two hours, after noon, to which the painters reſort, either to deſign or paint, and where ſculptors model after a naked perſon. There are twelve profeſſors, each of whom keeps the ſchool for a month; and there are twelve adjuncts to ſupply them in caſe of need. The profeſſor upon duty places the naked man, who is called the model, in ſuch a poſition as he thinks proper, and ſets him in two different attitudes every week: this is what they call ſetting the model. In one week of the month he ſets two models together, which is what they call ſetting the groupe. The paintings and models made after this

this model, as well as the copies made from them, are called academies, or academy figures. They have likewise a woman who ſtands for a model in the public ſchool. Every three months, three prizes for deſign are diſtributed among the eleves, or diſciples, as are two others for painting, and two for ſculpture, every year. Thoſe who gain the prizes of painting and ſculpture, are ſent to Rome, at the king's expence, to ſtudy there, and compleat themſelves in their art.

Beſides the royal academy, there are two other ſchools, or academies, of painting in Paris; one whereof is at the royal manufacture of the Gobelins: this ſchool is under the direction of artiſts, to whom the king allows an apartment in the royal hotel of the Gobelins, and who generally are members of the royal academy. The other is the academy of St. Luke, which is maintained by the company of maſter-painters and ſculptors, and was eſtabliſhed by the provoſt of Paris, on the 12th of Auguſt, 1391. Charles VII. in the year 1430, granted to it ſeveral privileges, which were confirmed in the year 1584, by Henry III. and in 1613, the companies of painters and ſculptors were united. This company hath at preſent a houſe near St. Denis de la Chartré, where their office is held; and a public academy carried on in the ſame manner as the royal academy, and where every year they diſtribute, among their diſciples, three prizes for deſigns. The only academy we have in England of this kind, is in St. Martin's-lane, London.

ACADEMY *of Architecture*, a company of ſkilful architects, eſtabliſhed at Paris in the year 1671, by M. Colbert, under the direction of the ſuperintendant of the buildings.

ACADEMY is alſo uſed in ſpeaking of the ſchools and ſeminaries of the Jews, where their rabbins and doctors inſtructed the youth of their nation in the Hebrew language, and explained to them the Talmud and the ſecrets of the Cabala. The Jews have always had theſe ſort of academies ever ſince their return from Babylon: thoſe of Tiberias and Babylon have been the moſt celebrated.

ACADEMY is alſo particularly underſtood of a riding ſchool, or a place where young gentlemen are taught to ride the great horſe, as alſo the uſe of arms, dancing, vaulting, &c. This is what Vitruvius calls ephebeum; and ſome others, among the ancients, gymnaſium; the moderns call it equeſtrian, or military academy.

The duke of Newcaſtle will have the art of riding to have had its origin in Italy; and the firſt academy of this ſort to have been eſtabliſhed at Naples, by Frederic Griſon, who, he adds, was the firſt that wrote on this ſubject, which he did, like a true cavalier, and a good maſter. Henry VIII. ſays the ſame author, called over two Italians, diſciples of Griſon, into England, who ſoon ſtocked the nation with ecuyers, or riding-maſters.

He adds, that the greateſt maſter which Italy ever produced, was a Neapolitan, called Pignatelli; that La Broue rode under him five years, Pluvinel nine, and S. Antoine many years; and that theſe Frenchmen filled France with French maſters, which, till then, had known only Italians.

The ground ſet apart in an academy for riding, is called the menage, having uſually a pillar in the centre, and other pillars placed two by two at the ſides.

ACADEMY *Figures*, in painting, are deſigns made after a model with a crayon or pencil.

ACAJOU, the *Caſhew-Nut-Tree*, in botany, the name of a genus of trees, comprehended by Linnæus among the anacardiums. See ANACARDIUM.

ACALEPTIC, in the ancient proſody, an appellation given to ſuch verſes as have all their feet complete.

ACALYPHA, in botany, the three-ſeeded mercury, a plant that produces male and female flowers, neither of which have any petals: the calyx of each are compoſed of three roundiſh leaves; from the cup of the male flowers ariſe eight or ten ſtamina; in the center of the female flowers, a round oviary is ſituated, ſupporting three branching ſtyles; when the flowers decay, the oviary is divided into three cells, containing in each one large round ſeed. This plant is the ricinocarpos of Boerhaave.

ACANACEOUS, in botany, are plants of the thiſtle kind, having heads with prickles on them.

ACANTHA, among botaniſts, a name given to the prickles of thorny plants.

ACANTHA, is alſo uſed by zoologiſts for the ſpines of certain fiſhes, as thoſe of the echinus marinus, &c.

ACANTHA is alſo a term uſed by ſome anatomiſts, for the protuberances of the back-bone, otherwiſe called ſpina dorſi.

ACANTHABOLUS, in ſurgery, a kind of forceps, or inſtrument for pulling out thorns, and other ſharp-pointed bodies, that may have penetrated the ſkin: alſo an inſtrument for pulling hairs from the eye-brows, &c.

ACANTHACEOUS, among botaniſts, an epithet given to all plants of the thiſtle kind, on account of the prickles with which they are beſet.

ACANTHUS, in botany, the branca urſini, or bears breech; this plant produces a monopetalous unequal flower, with a double empalement, the outer compoſed of three leaves indented: the inner empalement conſiſts of two leaves, the upper one concave, and ſerrated at the top, and the

under one convex; this flower produces four ſtamina, two long, and two ſhort, cloſely adhering to the ſtyle, which is ſituated on a roundiſh germen, that afterward becomes an oval capſulæ, producing two cells containing in each one fleſhy ſmooth oblong ſeed.

ACANTHUS, in architecture, an ornament repreſenting the leaves of the herb acanthus, and uſed in the capitals of the Corinthian and Compoſite orders. See the article CAPITAL.

For this purpoſe, the Greek ſculptors imitated the leaves of the ſoft acanthus, as the Goths did thoſe of the prickly kind.

ACARNA, a name by which Theophraſtus calls the common thiſtle.

ACARUS, in zoology, a numerous genus of inſects, comprehending the mites in general, and the lice of ſeveral animals.

ACATERY, or ACCATRY, an officer in the king's houſhold, deſigned as a check between the clerks of the king's houſhold and the clerks of the kitchen.

ACATHUSTUS, in eccleſiaſtical hiſtory, a hymn anciently ſung in the Greek church, in honour of the Virgin.

ACAULIS, in botany, thoſe flowers which have no viſible ſtalks, but appear to reſt on the ground.

ACCEDAS *ad curiam*, in law, a writ lying where a man hath received or fears falſe impriſonment in a hundred court, or court baron.

ACCELERATED, in a general ſenſe, implied quickened, or continually increaſing in motion.

ACCELERATED *Motion*, in phyſics, is that whoſe velocity is continually increaſing; and when the velocity is equally increaſed in equal times, it is ſaid to be uniformly accelerated.

The accelerated motion of falling bodies is produced by the impulſe of gravity, which keeps conſtantly acting upon them, and thereby communicating a new increaſe of motion every inſtant.

The acceleration of the deſcent of heavy bodies was firſt diſcovered by Galilæus; and by due application of Sir Iſaac Newton's ſecond law of motion, is clear and evident, viz. *That the change of motion is always proportionable to the force impreſſed, and is always according to that ſame line of direction.* For ſuppoſing gravity, at equal diſtances from the earth's center, to act uniformly on all bodies, and that the time in which any body falls to the earth be divided into infinitely ſmall and equal parts: let gravity incline the body towards the earth's center, while it moves in the firſt infinitely ſmall part of the time of its deſcent; if after this the action of gravity ſhould ceaſe, the body would go towards the earth's center equally, with a velocity equal to the force of that firſt impreſſion. But then, if we ſuppoſe that the action of gravity does continue, in the ſecond inſtant the body will receive a new impulſe towards the earth, equal to that which it received in the firſt inſtant, conſequently its velocity will be doubled, in the third inſtant trebled, in the fourth quadrupled, and ſo on: for the impulſe made in any preceeding inſtant is no ways altered by that which is made in the following; wherefore the inſtants of time being ſuppoſed infinitely ſmall, and all equal, the velocity acquired by the falling body will be in every inſtant as the times from the beginning of the deſcent, and conſequently the velocity will be proportionable to the time in which it is acquired.——After the ſame manner it may be proved that the motion of aſcending projectives ſhall be equably retarded; for ſince the force of gravity acts continually and equably againſt the motion firſt begun, it muſt diminiſh or abate the motion according to the time of aſcent, till at laſt it entirely ceaſe.

The ſpace run through by a moving body during a given time, and with a given velocity, may be conſidered as a rectangle compounded of the time and velocity.——Let the right line AB (Plate II. *fig.* 1.) expreſs the time of any heavy body's deſcent, and let BC, at right angles to it, denote the velocity acquired at the end of the fall. Draw AC, and divide AB into any number of equal parts, denominated intervals or proportions of the given time, as DE and FG, which will expreſs the velocities acquired in the times of deſcent AD and AF; for becauſe of the ſimilar triangles AB : AF :: BC : FG, and as AF : AD :: FG : DE; wherefore it is evident that the velocities are as the times of deſcent; that is, as the lines or elements of the triangle ABC, drawn parallel to the baſe BC.

By imagining ſhorter diviſions of time, for example, but half ſo long as the former, the indentures of the figure will be proportionably more contracted, and it will approach near unto a triangle: And if they be taken infinitely ſmall; that is, if increments of the velocity be ſuppoſed to be acquired continually, and at each indiviſible particle of time, which is really the caſe, the rectangles ſo ſucceſſively produced will form a true triangle, as ABE; (See Plate II. *fig.* 2.) the whole time AB conſiſting of minute portions of times, A 1, A 2, &c. and the area of the triangle ABE, of all the minute ſurfaces, or minute trapeziums, which anſwer to the diviſions of the times; the area of the whole triangle expreſſing the ſpace run through during the time AB. Or the triangles ABE, A 1 *f* being ſimilar, their areas are to each other, as the ſquares of their homologous ſides AB, A 1, &c. and conſequently the ſpaces gone through, are to each other as the ſquares of the times.

Whence alſo may be deduced this great law of acceleration: *That a body deſcending with an uniformly accelerated motion, deſcribes in the whole time of its*

its descent, a space which is exactly the half of that which it would describe uniformly in the same time, with the velocity it acquires at the end of its fall. For, as we have already shewn, the whole space which the falling body has run through in the time AB, will be represented by the triangle ABE; and the space that body would run through uniformly in the same time, with the velocity BE, will be represented by the rectangle ABEF: But it is well known, that the triangle is exactly equal to half the rectangle: so that the space run through, will be the half of that which the body would describe uniformly in the same time, with the velocity acquired at the end of its fall.

We may therefore conclude, 1st, That the space which would be uniformly described in half the time AB, with the ultimately acquired velocity BE, is equal to that which has been actually run through by the falling body during the whole time AB.

2d. If the falling body describes any given space, or length, in a given time; in twice that time, it will describe four times as much; in thrice that time, nine times as much, &c. In a word, if the times are in proportion to each other, as the series 1, 2, 3, 4, &c. the spaces run through will be as the squares of these numbers, that is, as 1, 4, 9, 16, &c. that is to say, if a body describes, for example, 16 feet in the first second minute of its fall, in the two first taken together, it will describe four times 16 feet; nine times 16 feet in the three first seconds taken together; and so on.

3d. The spaces described by falling bodies, in a series of equal instants or intervals of time, will be as the odd numbers 1, 3, 5, 7, 9, &c. that is, the body which has run thro' 16 feet in the first second, will in the next second run thro' 48 feet, in the third second 80 feet, &c. and since the velocities acquired in falling are as the times, the spaces will be likewise as the squares of the velocities; and the times and the velocities in the sub-duplicate ratio of the spaces.

The motion of an ascending body, or of one that is impelled upwards, is diminished or retarded by the same principle of gravity acting in a contrary direction, after the same manner that a falling body is accelerated. See RETARDATION.

A body projected upwards, ascends until it has lost all its motion; which it does in the same interval of time that the same body would have taken up in acquiring by falling, a velocity equal to that with which the falling body began to be projected upwards. And consequently the heights to which bodies projected upwards, with different velocities, arrive, are to each other as the square of those velocities.

ACCELERATED *Motion of Projectiles.* See PROJECTILES.

ACCELERATED *Motion of compressed bodies.* See COMPRESSION and ELASTICITY.

ACCELERATION, in physics, an increase of velocity in the motion of a body; it is opposed to retardation, by which term is understood a diminution of velocity. See MOTION, VELOCITY, and RETARDATION.

ACCELERATION, in mechanics, implies the augmentation or increase of motion in accelerated bodies. See ACCELERATED *Motion.*

ACCELERATION of the Motion of Pendulums. See the article PENDULUM.

ACCELERATION, among the old astronomers, implied the difference between the revolution of the primum mobile and that of the sun, and which they computed to be about three minutes and fifty-six seconds.

ACCELERATIVE *Quantity of centripetal Force*, in physics, is the measure of that force, proportional to the velocity which it generates in a given time. See CENTRIPETAL FORCE.

ACCELERATOR, in anatomy, the name of two muscles of the penis, so denominated from their accelerating the discharge of the urine and semen.

ACCENDENTES, or ACCENSORES, in the Roman church, are a lower class of ministers, whose principal business consists in lighting, snuffing, and trimming the lamps, candles, and tapers.

ACCENSI, in the Roman armies, were a sort of supernumerary soldiers, intended to supply the places of those who might be killed or disabled.

ACCENT, in a general sense, signifies a certain tone or manner of speaking, peculiar to some country or province.

ACCENT is used in grammar for the particular affection or impression of the voice on certain words and syllables, by which they acquire their due force and meaning. Some who have written upon this subject make a distinction between accent and tone, referring the former to the variation of the time in speaking, and the latter to the different modulations or inflexions of the voice. But there seems to be no occasion for such a distinction: we shall therefore consider them as one and the same thing, in treating of this article.

The ear is soon satiated with a continuation of one and the same sound; nor can the soul be affected at all by the same motions and percussions of the air. Nature therefore has wisely instructed the voice, in every language, not to move by single and uniform sounds, nor to strike perpetually the same notes, without any variation of the time. No: — by such a pronunciation as this, every sound must necessarily be surd and unmeaning, painful to the voice, and ungrateful to the ear. Repeat only the following line in the same tenor, unchanged alike in time or accent, through every syllable, and you will have no idea yourself, nor be understood by any one else:

Was

Wās | glād—thāt | nōw | hīs | fcā | ā | ſhōre ſhould | find.

But if you unite every two of theſe ſounds into one movement, and let your voice alternately reſt on one, and ſlip over another, and riſe on one, and fall on the other, you will find a meaning, and ſpeak and be heard with pleaſure. This reſting and varying of the voice is what we properly call the accent; and this it is which gives to every language its peculiar ſtrength, ſweetneſs, and harmony. It is very juſtly remarked by Cicero, that "mira eſt natura vocis, cujus quidem, e tribus "omnino ſonis inflexo acuto gravi, tanta ſit, et "tam ſuavis varietas perfecta in cantibus. Eſt "autem in dicendo etiam quidam cantus." *The nature of the voice is admirable, which from three modulations only, the circumflex, the grave, and the acute, affords ſo great and pleaſing a variety of ſinging: nay there is a kind of chant even in our common diſcourſe.* Every language has its peculiar accent, which differs according to the genius and temper of the people by whom it is ſpoken: it is either grave or acute, ſtrong or weak, rare or frequent. This it is which regulates the muſic of different countries, giving to each that particular character which makes it ſtrictly its own: for as theſe are the ſounds by which nature teaches us to expreſs the various emotions of the ſoul, no muſic can poſſibly affect or captivate us that is not in ſome meaſure directed by them. And this perhaps is the true reaſon why an Engliſh audience is juſtly diſpleaſed with the greateſt part of the recitative that is performed on our theatres. It does not bear any reſemblance to our common manner of expreſſing ourſelves; but is generally borrowed from the Italians, and ſeems indeed to be nothing elſe than the accent of that language carried a little beyond its natural pitch.

It has long been a matter of much contention amongſt the learned, whether the Greeks originally made uſe of accents, or they are of modern invention: We would here be ſuppoſed to mean thoſe three characters that are placed over the ſyllables of their words, to denote the accent. Theſe are, firſt, The *acute accent*, when the voice is to be raiſed, which is figured thus (´); ſecondly, The *grave acent*, when the voice is to be depreſſed, expreſſed thus (`); and thirdly, The *circumflex*, compoſed of the *acute* and *grave*, which is marked thus (῀ or ^). It is certain that in ſpeaking they muſt have made uſe of accents, as otherwiſe their language would have been ſurd and unmeaning: but it is very improbable, that they expreſſed their accents by particular marks; as we find that all ancient inſcriptions and manuſcripts can boaſt of very little preciſion, being written in capital letters, equidiſtant from each other, without the leaſt diſtinction either of words or phraſes. If they did not take the pains then to expreſs even their words exactly, ſo that they could not be miſtaken; how unlikely is it, that they ſhould mark, with ſuch prodigious accuracy, the manner in which every word was to be ſpoken? Indeed ſuch a labour as this appears to be unneceſſary; as there are very few words in a living language of ſo doubtful a ſignification, as to require that the pronunciation of them ſhould be expreſsly marked down, leſt they be miſunderſtood by the ignorant and unwary. How then ſhall we account for the introduction of theſe particular marks and characters? Shall we agree with Iſaac Voſſius, and other eminent grammarians, that they are of modern invention? but at what preciſe time were they firſt of all made uſe of? Some are of opinion, that they are not of much later date than about 900 years, and were introduced by the Arabs to prevent a barbarous pronunciation, which was then breaking in upon them: but it appears to us as if they were of much longer continuance; being in all likelihood invented, when Athens was the ſeat of arts and ſcience, when ſhe was in her meridian glory, the envy and admiration of the world. At that happy period, when the youth of all nations, but particularly of Rome, reſorted to her for inſtruction; when ſhe ſent forth her orators, her poets, her painters, and muſicians to every corner of the globe; theſe accents might then firſt of all be made uſe of to facilitate the knowledge of her language to ſtrangers, and aſcertain a pure and perfect pronunciation of it in foreign countries. But however this might be, certain it is, that they were never intended for thoſe ridiculous purpoſes, to which they have been wreſted by gothic and taſteleſs grammarians. They were undoubtedly meant for nothing, but to mark ſome certain inflexions and modulations of the voice: what theſe were, it is impoſſible at this length of time to determine; but one may be bold enough to affirm, that they could never be intended to affect the time or quantity of any word, for that would deſtroy all order and harmony, and throw the whole language into confuſion.

ACCENT is alſo made uſe of, but improperly, to expreſs the characters by which the quantity of any word is determined; ſuch is the *long accent*, which ſhews that the voice is to dwell upon that ſyllable, and is marked thus (¯).

The *ſhort accent*, which ſhews that the time of pronunciation ought to be quick, and is marked thus (˘).

There are perſons, who rank the hyphen, the diaſtole, and apoſtrophe, amongſt accents.

ACCENT is alſo applied to any particular tone, or brogue, that is contracted by any perſon, from the country or province where he has been bred: thus we ſay the northern accent, the Welch accent, &c.

ACCENT is uſed too in poetry to ſignify the cadence or cæſura, but in this ſenſe it is improperly applied. In muſic it means the modulation of the voice, to expreſs any particular paſſion. Every bar or meaſure is divided into *accented* and *unaccented* parts. The accented parts are the principal, being thoſe intended chiefly to move and affect: it is on theſe the ſpirit of the muſic depends. The harmony muſt always be full and free from diſcords in the accented parts; in the others it is not ſo abſolutely neceſſary, as they are frequently paſſed over unobſerved.

ACCENTOR, in muſic, implies one of the three fingers in parts, or the perſon who ſings the higheſt part in a trio.

ACCEPTANCE, in the common law, ſignifies the tacitly agreeing to ſome act before done by another, and which might have been defeated before acceptance.

Thus, if a biſhop before the ſtatute of 1 Elizabeth, leaſed part of his biſhopric for a term of years, at a certain rent, and dies before the term is expired; the new biſhop, if he accepts and receives the rent when due, the leaſe is confirmed, which otherwiſe the new biſhop might have ſet aſide. In like manner, if baron and feme, ſeized of land in right of the feme, join and make a leaſe or feoffment, at a certain reſerved rent, and the baron dies before the leaſe be expired; the feme, if ſhe receives or accepts the rent, ſhe confirms the leaſe or feoffment, and this acceptation ſhall bar her from bringing a *cui in vita*.

ACCEPTANCE, among civilians, implies the conſenting to receive ſomething offered, which had we refuſed could not have taken effect.

ACCEPTANCE, among merchants, denotes the ſigning or ſubſcribing a bill of exchange, by which the acceptor obliges himſelf to pay the contents of the bill, even though the drawer ſhould fail before it becomes due. See BILL *of Exchange*.

ACCEPTATION is uſed in grammar, to ſignify the particular ſenſe in which a word is taken or received: thus we ſay, Such a word in its firſt and natural acceptation denotes, &c. It is owing to the different acceptation in which words are taken, that ſo many diſputes ariſe, and are carried on in the world.

ACCEPTILATION, among civilians, ſignifies an acquittance given by a creditor to a debtor, without receiving any money.

ACCEPTOR, or ACCEPTER, among merchants, the perſon who accepts a bill of exchange.

ACCESS, in a general ſenſe, denotes the approach of one towards another.

ACCESS, in a more limited ſenſe, implies a permiſſion or leave to come near any perſon, place, or thing.

ACCESS, among phyſicians, is uſed for the beginning of a paroxiſm, or fit of ſome periodical diſeaſe.

ACCESSARY, or ACCESSORY, in law, ſignifies a perſon who was any ways aiding or aſſiſting in a felonious action.

Acceſſaries are of two kinds, before and after the fact.

An acceſſary before the fact, is a perſon, who, though abſent at the time the fellony was committed, yet had previouſly procured, counſelled, or commanded the principal to commit it.

An acceſſary after the fact, is a perſon, who knowing the felony to be committed by another, receives, relieves, comforts, and aſſiſts the felon.

In caſes of high treaſon, there can be no acceſſaries, either before or after; for all conſenters, knowing receivers, or comforters of traitors, are principals.

In caſes that are criminal but not capital, there can be no acceſſaries, for all the acceſſaries before the fact, are in the ſame degree as principals; and acceſſaries after, cannot be in law under any penalties as acceſſaries, unleſs the acts of parliament that inflict thoſe penalties, do alſo expreſsly extend to receivers or comforters, which ſome do.

It follows therefore, the term acceſſary refers only to felonies, whether by the common law, or by act of parliament.

ACCESSIBLE, ſomething that may be approached.

ACCESSIBLE *Altitude*. See ALTITUDE.

ACCESSION, among civilians, is uſed to imply the property acquired in ſuch things as are connected with, or appendages of other things.

ACCESSION, among phyſicians, ſignifies the ſame with what is generally called paroxiſm. See PAROXISM.

ACCESSION, among politicians, is uſed to ſignify a prince's agreeing to, and becoming a party in a treaty already concluded between other potentates: and alſo to denote a prince's coming to the throne, on the death of the preceding king.

ACCESSION, in the Roman church, implies a peculiar method of electing the pope; and conſiſts in one of the candidates having obtained two thirds of the votes; for when this happens, the reſt are enrolled by acceſſion.

ACCIDENT, in a general ſenſe, implies ſomething that is unuſual, or that happens by chance.

ACCIDENT, a term in grammar, which is made uſe of to ſignify a property that is really attached to a word, though it is not in the definition eſſential to it. Beſides the accidents that are peculiar to nouns ſubſtantives, ſuch as the caſe, gender, declenſion, and number, there are four others that are attendant on words. The firſt is, when a word is uſed in a figurative ſenſe, or differently from what it was originally meant to ſignify. Thus for inſtance, the primitive meaning of the word bear, was that of a rough, ſhaggy, ſavage animal: from

which it is adopted to describe a person of a rude, aukward, and brutal behaviour.

The second is, when words are derivative, as godly, heavenly, earthly, &c. which come from the primitive words God, heaven, earth.

The third accident is, when from two or more simple words, a complex is formed: thus, for instance, from the simple words *common* and *wealth*, comes the compound term common-wealth; which does not convey the meaning of the two words of which it is made up, but acquires a sense of its own, and signifies state or kingdom.

The fourth is the accent or tone of voice with which words are pronounced, which frequently determines their meaning, nay, sometimes gives them a sense quite foreign to their original signification; as when they are spoken with passion, or ironically, &c.

ACCIDENT, in logic, is when we join a confused and undetermined idea of substance with a distinct idea of some mode; because that idea is capable of representing all things to which that mode can belong; as the idea of round comprehends all round bodies in general.

This idea, expressed by the adjective *round*, forms the fifth universal, and is called accident, because not essential to the thing to which it is attributed. It should, however, be here observed, that when we consider two substances together, we may consider one of them as the mode of the other: thus a dressed man may be considered as a whole, composed of the man and of his clothes: but the dress, with respect to the man, is only a mode under which we consider him, though his habit may be substances.

The Aristotelians, after distributing beings into ten classes, reduced them to two general ones, viz. substance and accident. From the latter they formed nine others; quantity, relation, quality, action, passion, time, place, situation, habitude.

ACCIDENT, in the healing art, implies a revolution, occasioned by a disease, or some new cause, which adds strength to a distemper already existing. Thus the sudden suppression of the saliva in a peripneumony, is a dreadful accident.

The most celebrated practitioners in physic, recommend a particular regard to the violence of accidents; because their continuance may augment the distemper in such manner, as to render it incurable.

ACCIDENTAL, in a general sense, is an epithet given to such things as happen by accident.

ACCIDENTAL *Point*, in perspective, is that point in the horizontal line, where all lines parallel among themselves meet the perspective plane.

ACCIPITER, in ornithology, the name of a whole race of birds, the distinguishing characteristic of which is, that they have a hooked, or crooked beak.

This order comprehends three genera, viz. the parrot, the owl, and the hawk kind.

ACCISMUS, in antiquity, denotes a feigned refusal of what one earnestly desires.

The accismus was a piece of political dissimulation, for which Augustus and Tiberius are famed.

ACCISMUS, in rhetoric, is accounted a species of irony. See IRONY.

ACCLAMATION, ACCLAMATIO, in Roman antiquity, a shout raised by the people, to testify their applause, or approbation of their princes, generals, &c.

ACCLAMATION, in rhetoric, the same with what is otherwise called epiphonema. See EPIPHONEMA.

ACCLAMATION *Medals*, among antiquaries, those whereon the people are represented as expressing their joy by acclamation.

ACCLIVITY, a term used to denote the ascent of a hill, or rising ground, as declivity is the descent.

ACCLIVITY is sometimes used by writers in fortification, for the talus of the rampart. See TATUS.

ACCOLADE, in antient customs, the ceremony of conferring knighthood, by the king's laying his arms about the young knight's neck, and embracing him.

ACCOLLE'E, in heraldry, a term used in different senses; sometimes it denotes the same with accolade; sometimes two things joined together; at other times, animals with collars or crowns about their necks; and finally, battons, or swords, placed saltierwise behind the shield.

ACCOMMODATION, among divines, is the applying what is said of one person or thing to another: thus the words of Isaiah, directed to the Jews of his time, are by St. Paul accommodated to the Jews who were cotemporaries with that apostle.

ACCOMMODATION is also used for an amicable agreement between two or more contending parties.

ACCOMPANYMENT, in music, is used for the instruments which accompany a voice, to make the music more full.

Among the moderns, the accompanyment frequently plays a different part or melody from the song it accompanies; but authors are not agreed whether it was so among the ancients.

ACCOMPANYMENT, in heraldry, denotes any thing added to a shield by way of ornament, as the belt, mantling, supporters, &c.

ACCOMPANYMENT is also used for several bearings about a principal one, as a saltier, bend, fess, &c.

ACCOMPLICE, in law, a person who is privy to, or aiding in the perpetration of some crime. See ACCESSARY.

By

By the law of Scotland accomplices cannot be profecuted till the principal offenders are firſt convicted.

ACCOMPLISHMENT, in a general ſenſe, denotes the perfecting, or entirely finiſhing and compleating any matter or thing.

ACCOMPLISHMENT is more particularly uſed for the fulfilling of a prophecy; in which ſenſe we read of a literal accompliſhment, a myſtical accompliſhment, &c. See the article PROPHECY.

ACCOMPLISHMENT is ſtill more particularly uſed for the acquirement of ſome branch of learning, uſeful art, polite exerciſe, &c.

ACCOMPT and ACCOMPTANT. See ACCOUNT and ACCOUNTANT.

ACCORD, in muſic, the ſame with what is more uſually called concord. See CONCORD.

ACCORD, in law, a verbal agreement between two or more, where any one is injured by a treſpaſs, or other offence committed, to make ſatisfaction to the injured party; who, after the accord is performed, will be barred in law from bringing any new action againſt the aggreſſor for the ſame treſpaſs. It is ſafeſt, however, in pleading, to allege ſatisfaction, and not accord alone; becauſe in this laſt caſe, a preciſe execution in every part thereof muſt be alledged; whereas in the former, the defendant needs only ſay, that he paid the plaintiff ſuch a ſum in full ſatisfaction of the accord, which he received.

ACCOUNT, or ACCOMPT, in a general ſenſe, is uſed for all arithmetical computations, whether of time, weight, meaſure, money, &c.

ACCOUNT is alſo uſed collectively, for the books in which merchants, traders, and bankers enter all their buſineſs, traffic, and bargains with each other.

The method of keeping theſe is called book-keeping. See BOOK-KEEPING.

To open an ACCOUNT, is to enter in the ledger the name, the ſurname, and the place of abode of the perſon with whom you have dealings; after which the ſeveral articles are poſted or placed, either on the credit or debit ſide, according as the perſon is become your creditor or debtor.

To place or poſt a ſum to ACCOUNT, is to enter it in the ledger, either on the debit or credit ſide, according as the perſons are become debtors or creditors.

To examine an ACCOUNT, is to read it exactly, in order to prove the truth of the computation, or detect errors, if there are any.

To ſettle an ACCOUNT, is to ſum up all the articles, both on the debit and credit ſide, and find the balance between them; which being placed on the leaſt ſide, makes the ſum of both equal: this is otherwiſe called ſhutting, balancing, cloſing, or making up an account.

ACCOUNT *in Company*, an account kept by traders in partnerſhip, wherein all articles relating to their joint trade are entered.

ACCOUNT is alſo uſed in different ſenſes, as for profit, hazard, &c. Thus we ſay a man has found his account in ſomething, or it has turned to good account; alſo, if a man commits errors, they ſhall be on his own account, &c.

ACCOUNT, in law, is a writ or action which lies againſt a perſon, who, by reaſon of his office or buſineſs, is obliged to render an account to another, but refuſes to do it; as a bailiff, for inſtance, to his lord.

ACCOUNT, in the remembrancer's office in the exchequer, is the ſtate of any branch of the king's revenue; as the account of the mint, of the wardrobe, of the army, of the navy, &c.

Chamber of ACCOUNTS, in the French polity, a ſovereign court, anſwering nearly to our exchequer. See EXCHEQUER.

ACCOUNT *of Sales*, among merchants, an account of the diſpoſal and net proceeds of certain merchandizes, after deducting charges and commiſſion.

Auditing an ACCOUNT, the examining and paſſing it by an officer appointed on purpoſe.

ACCOUNTANT, or ACCOMPTANT, in a general ſenſe, denotes one whoſe buſineſs it is to keep accounts.

ACCOUNTANT-*General*, in the court of chancery, a new officer appointed by act of parliament, to receive all monies lodged in court, and convey the ſame to the bank of England, for better ſecurity. The ſalary of this officer and his clerks is to be paid out of the intereſt made of part of the money, it not being allowable to take fees in this office.

ACCOUTREMENT, an old term, ſignifying dreſs, ſtill uſed for the furniture of a ſoldier.

ACCRETION, in natural hiſtory, the increaſe or growth of a body by an external addition of new parts: thus it is, ſalts, ſhells, ſtones, &c. are formed.

ACCRETION, among civilians, a term uſed for the property acquired in a vague or not occupied thing, by its adhering to or following another thing already occupied; thus, if a legacy be left to two perſons, and one of them die before the teſtator, the legacy devolves to the ſurvivor by right of accretion. Alluvion is another inſtance of accretion. See ALLUVION.

ACCROCHE, in heraldry, denotes a thing's being hooked into another.

ACCUMULATION, in a general ſenſe, the act of heaping or amaſſing things together.

ACCUMULATION, among lawyers, denotes the concurrence of ſeveral titles to the ſame thing, or of ſeveral circumſtances or proofs to make out one fact.

ACCUSATION, among civilians, the bringing a criminal action againſt any perſon; in which ſenſe it differs only in circumſtances from what among

among us is called impeachment. See IMPEACHMENT.

ACCUSATIVE, in grammar, is the fourth caſe of nouns, in thoſe languages that have declenſions, that is, whoſe words have different terminations aſſigned them, according to the different relations in which they ſtand with reſpect to the verb. Varro ſays, "Sunt deſtinati caſus, ut qui "de altero diceret diſtinguere poſſet quum vocaret, "quum daret, quum accuſaret; ſic alia quædam "diſcrimina quæ nos et Græcos ad declinandum "duxerunt." *The caſes of nouns were invented, that he who ſhould ſpeak of another might diſtinguiſh when he would call, when he would give, when he would accuſe; ſo there are other diſtinctions too, which induced us and the Greeks to decline our nouns.*

The termination of the accuſative caſe ſerves to diſcover the word which marks the term, or the object of the action, which the verb ſignifies. All verbs that expreſs actions which paſs from the agents, as I deſpiſe, I conquer, &c. muſt have ſubjects to receive thoſe actions: for if I deſpiſe, I muſt deſpiſe ſomething; ſo that ſuch a verb evidently requires after it a noun or name, to be the object of the action expreſſed. In Engliſh we have nothing to denote the accuſative caſe, but the place in which the noun ſtands, as I hate *hypocriſy*, the accuſative naturally following, and the nominative preceding the verb. Where there is any tranſpoſition of the words, as frequently happens in poetry, the ſenſe muſt determine which is the accuſative caſe, and which not, as in the following lines:

"And oh! you mortal engines, whoſe rude throats
"Th'immortal Jove's dread clamours counterfeit!"

which in proſe would run thus: "Oh you mortal "engines, whoſe rude throats counterfeit the "dread clamours of immortal Jove!"

ACEPHALI, or ACEPHALITÆ, a name given by eccleſiaſtical hiſtorians to ſeveral ſects who were deſtitute of any head or leader. They alſo extended it to ſuch biſhops as were exempted from the diſcipline and juriſdiction of their patriarch.

The word is Greek, and compounded of α priv. κεφαλη, a head.

ACER, in botany, the maple-tree. See the article MAPLE-TREE.

ACETABULUM, in antiquity, a certain meaſure equal to one eighth of our pint.

ACETABULUM, in anatomy, implies a large cavity in a bone, formed for receiving the convex head of another bone, in order to admit of a circular motion in the joint formed by this articulation.

ACETABULUM alſo ſignifies a kind of glandular ſubſtance, generally called cotyledon, many of which are found in the placenta of ſome animals. See COTYLEDON.

ACETOSA, ſorrel, in botany. See SORREL.

ACETUM, vinegar. See VINEGAR.

ACHATES, the agate, in natural hiſtory. See AGATE.

ACHILLEA, in botany, is a name given to the ptarmica and millefolium of Tournefort. The common ſort, known by the name of yarrow, is a plant that grows wild in moſt parts of England; the flowers make an agreeable appearance, but blow not ſo well in gardens as in uncultivated places: there are other ſorts that are claſſed under the general name, which are moſt of them natives of foreign countries.

ACHILLEID, or ACHILLEIS, a poem of Statius, in which the author propoſed to recount the whole life and exploits of Achilles; but being prevented by death, he hath only treated of the infancy and education of his hero.

Notwithſtanding the opinion of Scaliger, who prefers Statius to all the heroic poets, Greek and Roman, not excepting even Homer himſelf, every impartial judge muſt allow that he is deficient in imagination, as well as judgment; and that his language, thro' a conſtant affectation of grandeur and ſublimity, is for the moſt part ſtiff, unnatural, and bombaſt. As to the work itſelf, he has certainly made choice of a very improper ſubject for an epic poem, as it would not allow of that unity of action which is abſolutely eſſential to compoſitions of this nature. Accordingly the Achilleid is not ſo much an epic poem, as a hiſtory in verſe.

ACHILLES, an appellation ſometimes given to the principal argument made uſe of by each ſect of ancient philoſophers, in defence of their ſyſtem.

Tendo ACHILLES, in anatomy, is a large tendon formed by the union of the tendons of the four extenſor muſcles of the foot. It has its name from the fatal wound which Achilles received before the walls of Troy, in that part.

ACHOR, in medicine, a ſmall ulcer in the ſkin of the head, perforated with a great many little holes, which contain a viſcid humour reſembling ichor. It is the third ſpecies of a tinea, or ſcald-head. See the article TINEA.

ACHRONICAL, in aſtronomy. See ACRONICAL.

ACID, any thing which affects the tongue with a ſenſe of ſharpneſs and ſourneſs.

The word is formed from the Latin *acidum*, which is derived from the Greek ακη, a point or edge.

The chemiſts call all ſubſtances acids, which make an effervescence with an alcali. However, this does not ſeem to be a true characteriſtic of acids, becauſe ſome acids will cauſe an effervescence, upon being mixed with acids of a different kind; and alcaline ſubſtances will do the ſame with alcalies; and acids with bodies which are neither alcaline nor acid, but neutral.

Another

Another mark of acids is, that they change the colour of the juices of heliotropium, roſes, and violets, red; whereas animal alcalies turn them green. We mention animal alcalies, becauſe others will not always produce that effect.

The celebrated Boerhaave has made a great number of experiments to prove that oil is the pabulum or food of fire, and an acid ſeems eſſential to the compoſition of oil. That vegetable oils contain an acid is, in ſome, manifeſt to the taſte, and we can obtain it from others by diſtillation. This acid is the cauſe why oils ſo readily mix with alcaline ſalts, and why they are, by this juncture, neutralized, and converted into ſoap. Hence we have another very obvious characteriſtic, which will more juſtly diſcover acids in bodies, than either their cauſing an effervеſcence with alcalies, or producing a red colour when mixed with the juice of heliotropium, roſes, or violets, viz. that all bodies whatever which will flame, contain either a manifeſt or a latent acid; for acids are, probably, the only bodies in nature that are convertible into that ſpecies of fire which we call flame. Vegetables flame ſo long as their black oil contains an acid both by its ſmell and effects.

Mineral oils in general contain a manifeſt acid, as the oil of coal, petrolæum, naphtha, and all kinds of bitumens.

In animal oil the acid is not ſo manifeſt, but ſeems wrapt up in a large portion of volatile alcaline ſalts. But we may conclude, that an acid enters its compoſition; firſt, becauſe after it is cleared from the membraneous cells which contain it, and the blood-veſſels which enter it, though kept ever ſo long, it does not putrify like the other parts of animals, nor does it afford a nidus for the eggs of inſects, and breed maggots: but if it has once been deprived of a part of its alcaline ſalts by boiling, it will keep for ages unaltered and untainted in the hotteſt ſeaſons, of which tallow candles may ſerve as an obvious inſtance. Now acids are the great preſervatives againſt putrefaction, and known deſtroyers of thoſe kinds of inſects that breed in animal bodies.

Secondly, becauſe animal oils not only preſerve themſelves, but alſo all other animal and vegetable ſubſtances immerſed in them from putrefaction.

Thirdly, becauſe, like vegetable oils, they readily mix with alcaline ſalts, which they neutralize, as is evident in making ſome kinds of ſoap.

Pure acids are not eaſily inflammable by the common methods, becauſe of their ſolidity and ſtrong coheſion; but when they are divided into exceeding fine particles, diſperſed in the interſtices of other bodies, and by means of ſome other ſubject ſet on fire, they burſt into a lucid flame, and explode with the utmoſt violence.

Acids ſeem to be of the greateſt uſe in the economy of the world, becauſe they are ſo univerſal. In the bowels of the earth we meet with them in almoſt every mine and mineral; but principally in thoſe prodigious rocks of ſalt which are found in almoſt every country, and which the induſtry of a great many ages have not been able to exhauſt. Such are thoſe in the famous ſalt mines in Poland, and our own in Cheſhire, where vaſt quantities are got every year, and exported. Not to mention the quantities of acids hourly diſcharged from the bowels of the earth, in the ſalt which may be found, by a nice examination, in the waters of every ſpring, the freſheſt not excepted.

In the air the acid is univerſal, and that in every part of it.

It is remarkable that the acid abounds more in the air, when the winds blow from the eaſt and north, and when the weather is ſerene. This the learned Hoffman informs us, is confirmed by the obſervations of thoſe who are concerned in nitre-works, who remark, that, during theſe winds, their alcaline earth is impregnated with an acid.

Phyſicians have obſerved, that the ſouth winds favour peſtilential conſtitutions of the air, eſpecially if the ſeaſon happens at the ſame time to be moiſt and rainy; and that the malignancy is abated by winds which blow from the north and north-eaſt: ſo that there is reaſon to believe that the alcaline contagion is deſtroyed by the aerial acid.

The acids of vegetables, ſays the accurate Boerhaave, are either native, or produced by the help of fermentation. Native vegetable acids ſeem to owe their origin entirely to the juices which the plants draw from the earth that nouriſhes them; and hence all theſe may perhaps be looked upon as belonging originally to the foſſile kingdom, eſpecially as plants which grow in the ſea, and have not their roots inſerted in the earth, conſiſt purely of alcaleſcent parts, and, in diſtillation, yield an oily, volatile acid.

In ſome vegetables the native acids diſcover themſelves evidently; as in ſorrel, the trefolium acetoſum, and the juice of all fruits, eſpecially while unripe; for when concocted by the heat of the ſun, they grow more mild. The ſap likewiſe of all vegetables, which riſes in the ſpring, is almoſt as acid as vinegar. Many woods alſo and aromatics contain a true acid, though not ſo manifeſt. Who could have expected to have found an acid in guaiacum, ſaſſafras, cinnamon, and a great many more of the ſame kind, if diſtillation had not demonſtrated it? But fermentation ſeems more and more to exalt the latent acid of vegetables; for the juices of vegetables which are exceeding ripe and ſweet appear to have ſcarcely any thing acid in them, as we ſee evidently in the expreſſed juice of grapes. Who can perceive any thing like acid in caſſia, manna, honey, and ſugar? and yet, when theſe are properly fermented, the acid

prefently appears, efpecially when the wine begins to grow finer, and more fubtile. Is there the leaft indication of an acid in ripe mealy corn? and yet even this, after a little fermentation, difcovers an acidity. As thefe acids are fomething different, and of a more fubtile nature than native ones, they are generally called vinous acids. They are of two forts; for they are either difperfed through the wine, in form of liquid acids, or elfe gradually collect themfelves together in the wine, and fix themfelves to the furface of the veffel, in the folid form of tartar.

But the acids of vegetables produced by a fecond fermentation are generally called acetofe: for if any known wines are, by an admixture of auftere, acid, crude juices, made to undergo again a proper acetofe fermentation, they will be converted into vinegars, will confume their own tartar, become much more acid, and acquire a ftronger and more durable fourneſs, which will remain even in diftillation: hence there may be obtained from vinegars, by diftillation, a pure active acid of the utmoft fervice in chemiftry.

It will alfo be neceffary to take notice here of what are called fermenting acids; by which we mean vegetable juices in the very act of fermentation, and confequently in a kind of middle ftate between that which is natural to them, and that which they obtain when the fermentation is compleated; for, during this interval, the moft elaftic part of the fermenting liquid acquires fuch a power as is hardly to be equalled by any thing in nature: for if this favage, incoercible, explofive, acid fpirit, rifing from a vaft quantity of fermenting vegetables, fhould pafs through a very fmall vent-hole into the noftrils of the ftrongeft man, it would ftrike him dead in an inftant. If it does not act with all its force, it caufes a fudden apoplexy; if lefs powerful ftill, a lofs of the fenfes, with a paraplegia; if very lightly, only a vertigo. The truth of this has been too certainly proved by many melancholy inftances.

There are alfo difcovered other very fingular acids, that are, in fome meafure, of a balfamic and oily nature; we mean fuch as are drawn from vegetables by fire in a clofe veffel. Thus the wood of guaiacum, juniper, oak, and a great many others, if reduced to dry fhavings, and carefully diftilled in a retort, will yield a limpid reddifh liquor, which is very acid, fomewhat oily, and has a good deal of the fmell of a herring dried in the fmoke. This liquid may be rendered ftronger by depuration and rectification; and then the folvent virtue of this menftruum will appear to be very fingular.

Foffile native acids are rarely to be met with; for it is now difcovered, that the medicinal waters, once confidered as an acid, approach, in every character, nearer to an alcali. There is often indeed a vapour obferved in mines, which refembles a fuffocating, fulphureous acid, and by other marks demonftrates its acidity; but it is very feldom found alone unmixed, and in a fluid form.

But whenever it happens, which is very often the cafe, that it meets with a folid body, capable of attracting that acid, it unites with it, and becomes fixed and palpable: and when it is afterwards drawn out of that fixed body, it then falls under the cognizance of our fenfes; and then, as far as it is poffible for us to judge, appears to be always one and the fame.

For if it lays hold of a pinguious foffile, it produces various kinds of fulphurs, which, when burnt, emit fumes, which being collected, refrigerated, and mixed with the humid air, yield the fpirit or oil of fulphur per campanum. If you pour this acid liquor into a clean glafs veffel, and expofe it for a conſiderable time to a heat equal to that of boiling water, you will diftil from it a conſiderable quantity of pure water, which, whilft the fulphur was burning, had infinuated itſelf out of the air into the acid fumes of the fulphur; and there will then remain at the bottom a ponderous, thick, cauftic acid, which, in every character, refembles the pureft oil of vitriol, except in its having no particles of a volatile metal, which are always found more or lefs in oil of vitriol.

But if this acid happens to corrode lime-ftones, it then produces alums, which are different according to the diverfity of the matter which is mixed with them. All thefe, if they are at firft lightly calcined, and then with an intenfe fire urged into vapours, will, by a condenfation of thefe, yield a liquor, which, when purified according to art, is nearly the fame with the former procured from burning fulphur.

Again, if native green vitriol be reduced, by the help of a moderate fire, to a dry white powder, and then expofed to a fire gradually increafed to the moft extreme degree, it will emit white cloudy vapours, which, collected into a liquid, and accurately depurated, is again the very fame as was before obtained from fulphur and alum.

The blue vitriol likewife treated in the fame manner, yields a liquid, which is the fame with the former; nor can it be diftinguifhed from them, if rectified according to art.

Another foffile acid which we are acquainted with, is produced from nitre only, fo that there never was perhaps a fingle drop feen of it in the world but what was diftilled from nitre. For if nitre be intimately mixed with three times its quantity of bole, clay, brick-duft, or any thing of the like nature, and then urged with a very ftrong fire, a great part of it will be converted into red fumes, which, being condenfed into a liquid, is called fpirit of nitre. Or if dry nitre be mixed with an equal quantity of oil of vitriol, and diftilled in the ftrongeft fand-heat, gradually increafed, the fame fpirit

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of nitre will be procured from the ſame red fumes.

Or, laſtly, nitre rubbed with an equal quantity of the red calx of vitriol, or alum, and then urged with a very great degree of heat, will emit the ſame fumes, and from them yield a ſpirit of nitre, which is as good and as pure as the former; but it is then called by the chemiſts aqua fortis, aqua ſtygia, and aqua docimaſtica.

Sea-ſalt, like nitre, when it is pure, diſcovers no ſigns of acidity; but if it be treated in the manner juſt mentioned with regard to nitre, it is changed into a volatile acid liquor. For if, to prevent its melting, it is mixed with three times its weight of earth, and then urged by a fire gradually increaſed to the greateſt degree, it will be diſſipated into denſe white fumes, which float about, and are very volatile, but being collected, form a liquor of a golden or green colour.

If diſtilled with oil of vitriol, it yields the ſame liquor, but more volatile: and if mixed with the fæces of diſtilled alum, or vitriol, and afterwards expoſed to a very ſtrong fire, it will then give the ſame ſpirit of ſea-ſalt: and theſe ſpirits, prepared according to theſe three different ways, are entirely one and the ſame; and they will alſo be the ſame, whether they be made from ſal gemmæ, fountain, or ſea-ſalt. This ſpirit has this peculiarity, that if it be drawn from the pureſt ſalt, and you repeat the diſtillation upon freſh pure ſalt, when it begins, through the violence of the fire, to grow exceeding hot, it emits white fumes, and diſſolves gold, which no other acid in nature is able to penetrate.

ACIDS, in the materia medica, denote ſuch medicines as are poſſeſſed of an acid quality; ſuch are vinegar, ſpirit of vitriol, &c.

Theſe being powerful antiſeptics, are eſteemed good in all putrid and malignant diſeaſes, and by their cooling virtue are no leſs efficacious in inflammatory and feveriſh caſes. However, great care ought to be taken not to adminiſter them in ſuch large quantities as to corrode the bowels, or coagulate the blood.

Acids are alſo commended in the plague, and as ſtyptics. Thus, vinegar not only ſerves to ſtop hæmorrhages, but being ſprinkled upon a red-hot tile or iron, corrects the putrefaction of the air. See PLAGUE, &c.

ACIDITY, *Aciditas*, that quality in bodies which renders them acid. See ACID.

ACIDULÆ, a diminutive of acids, ſour, cold mineral waters, which contain a briſk ſpirit, in contra-diſtinction to *Thermæ*, or thoſe which are hot.

The name owes its original to a ſuppoſition that theſe waters were acid; which later obſervations and experiments have proved to be without foundation.

The admirable virtues and extraordinary efficacy of mineral waters, both hot and cold, in perfectly curing the moſt obſtinate and inveterate diſeaſes, are ſo well known and atteſted by long uſe, and an infinite number of experiments, as to put the matter beyond all manner of diſpute. But whence theſe waters derive their ſanative power and virtue, is a thing not ſo commonly known; and indeed there are very few who know how to diſcover, by a chemical examination, the elements and ingredients in which their wonderful efficacy conſiſts.

Now there is no better way to diſcover the elements of medicated waters, than by evaporating the liquid by a very gentle heat, either in a tin veſſel ſet over hot embers in the open air, or, which is better, in a glaſs cucurbit, carefully ſaving the liquid which drops from the alembic, that the proportion of the ſolid to the liquid may be obtained. If the evaporation be continued to a dryneſs, and the maſs left in the cucurbit be accurately weighed, we ſhall have the weight of the ingredients, which are of a more fixed nature, and, though of a different texture, muſt be examined.

Firſt then, a ſolution of the reſiduum muſt be made in pure diſtilled water, which is always requiſite for the more accurate examination of things chemically prepared; for many ſpring waters contain a conſiderable quantity of earth and ſalt. In this ſolution the ſalt is ſeparated, and the earth remains, being leſs ſoluble in water. It is eaſy to know whether this ſalt be alcaline, by mixing it with an acid, for then it forms a neutral ſalt; or with ſal ammoniac, in which caſe a ſtrong urinous ſmell will be produced; or it may be known by adding to it a ſolution of mercury ſublimate in water, for it will then precipitate a yellow powder; or if you mix it with ſyrup of violets, it will turn of a green colour.

The caſe is a little more difficult, when the ſalts left after evaporation are not of one and the ſame, but of different kinds; as when, for example, alcaline ſalts are mixed with thoſe which are neutral. In this caſe, pour common water on the dry maſs, and, after a gentle agitation, decant it off. By this means there will remain a ſaline powder not eaſily diſſoluble, for alcaline ſalts readily diſſolve in water. There is another way of ſeparating neutral ſalts from alcaline, and that is by cryſtallization; in which, rightly performed, every neutral ſalt being beſt adapted to receive a ſolid figure, deſcends firſt in the form of cryſtals, and nothing but a lixivious liquor remains, which ſwims on top, and receives with more difficulty a ſolid form.

The next thing is to determine the genuine nature and properties of thoſe neutral ſalts. In order to this, it muſt be obſerved, that no other ſalts are conveyed out of the bowels of the earth in the vehicle of water, than either common ſalt,

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or a kind of neutral ſalt, of a vitriolic and ſulphureous nature, being compounded of the acid of ſulphur, or vitriol, and a ſort of alcaline earth; the former, that is, common ſalt, may eaſily be diſtinguiſhed, partly by the taſte and cubical figure which it aſſumes by cryſtallization, and partly by emitting, when mixed with oil of vitriol, a copious white fume of a very penetrating ſmell. The other ſalt, which owes its origin to an univerſal, ſubterraneous, ſulphureous acid, is thus tried: mix two parts of this ſalt with one part of ſalt of tartar, and one part of powder of charcoal; let them incorporate and fuſe together in a crucible, in a melting heat; there will then be produced a red maſs, of a ſulphureous alcaline taſte, reſembling the liver of ſulphur, and from which, by highly rectified ſpirit of wine, a yellow tincture of ſulphur may be extracted, which will tinge ſilver of a ſooty colour.

From a ſolution of this maſs in water, by an acid liquor, is precipitated the true lac ſulphuris; a manifeſt proof that the mineral ſulphur, which is compounded of the univerſal acid and inflammatory principle, is revived in this proceſs. This is not only true with regard to all ſalts procured by art, but alſo by means of this proceſs, a ſulphureous alcaline maſs may be produced out of all the ſalts, common alone excepted, which are found in mineral waters, both hot and cold; with this difference, that if the neutral ſalt be compounded of an alcaline ſalt and the ſpirit of ſulphur, the fuſion by fire will be performed the more eaſily: but if this acid be united with a terrene, or gypſeo-calcareous ſalt, it becomes far more difficult.

Beſides alcaline and neutral ſalts, there is, in many cold mineral waters, a vitriolic ſalt, which is ſeldom of a fixed nature, but, for the moſt part, ſubtile and volatile. This ſalt is diſcovered, in all waters, by the dark purple and blackiſh colour which immediately follows from their being mixed with fine powder of galls, or the rhind of pomegranates. The volatility of the ſpirit of this vitriol, or rather of the acid of this mineral, which, in conjunction with martial or olearious particles, conſtitutes the ſubtile ſalt of vitriol, is manifeſt from thoſe mineral waters, which produce a black tincture on being mixed with powder of galls; for if they are expoſed for ſome time to the open air in a warm place, they loſe entirely their vitriolic taſte and faculty of changing their colour.

There remains yet ſomething to be examined in mineral waters, and that is their ſubtile ſpirituous particles, which ſeem to be of an æreo-ethereal nature, and to be endued with an elaſtic property. That they contain a great quantity of theſe is evident, both from the vapour which ſtrikes the noſtrils, and alſo from their affecting the head in drinking. To theſe particles muſt alſo be aſcribed the vaſt quantities of bubbles which are generated in ſome cold mineral waters, on their being poured out of one glaſs into another.

But theſe bubbles are generated in ſtill greater plenty, and with more force and celerity, when they are mixed with equal quantities of Moſelle, or Rhenish wine, or any other that contains a ſubtile acid and a little ſugar; for then they look well to the eye, and become of a delicious taſte, the vapours proceeding from them in ſuch plenty, that they ſeem to ſmoak. This effervescence which generates theſe bubbles, proceeds from the conflict of the alcaline ſalt, which prevails in mineral waters, with the ſubtile acid of the wine.

This ſpirituous principle, which reſides in theſe waters, is alſo the cauſe why veſſels or bottles cloſe ſtopped, when heated, burſt with great violence; a certain proof of the expanſive power of this ſubtile matter.

Moreover, the exiſtence of this ſpirituous principle, which ennobles mineral waters, may be proved by the help of an air-pump; for on exhauſting the receiver, ſo great a quantity of bubbles will riſe to the ſurface, that it will appear like a fluid heated to a degree of ebullition.

Such things, therefore, as have undergone an examination, and do not produce the like effects and phœnomena, may be looked upon as much inferior in virtue: for it is that ſubtile mineral ſpirit which endues the waters and their ingredients with ſuch extraordinary qualities, ſo as not only to enter immediately, and penetrate the very inmoſt receſſes and emunctories of the body, but alſo communicate greater ſtrength and elaſticity to the ſolids. Hence the paſſage of the waters through our bodies is facilitated, the veſſels freed from all obſtructions, and the ſecretion of uſeleſs matter in an extraordinary manner promoted.

But as there is no ſpring water which does not afford ſome quantity of an earthy ſubſtance, which, after evaporation, is hardly ſoluble, ſo we find the ſame in mineral waters, whether hot or cold, even in thoſe of the greateſt reputation for medicinal virtues. Now the nature and properties of this groſs ſubſtance ought alſo to be enquired into; for as the waters in their courſe meet with various kinds of earth, ſome particles thereof are eaſily taken up by the inteſtine motion of theſe waters.

Theſe particles are chiefly either chalky, okreous, clayey, or ſtoney. If the water be impregnated with particles of a chalky nature, it will produce an efferveſcence with an acid; or if the reſiduum after evaporation be calcined, it will acquire the higheſt degree of acrimony. If the waters, eſpecially thoſe which are hot, contain a large quantity of this chalky earth, it will ſeparate in cold weather, and ſtick to the veſſels which contain it, and in a little time cover them with a ſtoney cruſt.

If the ſediment which remains after cryſtallization and evaporation, be of a yelloviſh colour, and in calcining changes into a red, it is a ſign that the water is impregnated with martial particles, which never fail of producing ſalutary effects on the human body, by their gentle aſtringent and corroborating virtue.

But this okerous ſubſtance, though it derive its colour from iron, cannot be diſſolved by an acid, becauſe it is of the nature of clay.—Many waters abound with this bolar and martial earth, without other ſaline and ſpirituous ingredient; whence they are of no ſmall ſervice in chronic diſtempers, both drank and uſed as baths.

Beſides the hot and cold mineral waters in which alcalies predominate, there are other medicinal ſprings impregnated neither with acid nor alcali, nor capable of tinging ſyrup of violets, but containing only a ſalt of a neutral or middle nature, which may beſt be procured by evaporation.

ACIDULATED, among phyſicians, an appellation given to ſuch medicines as have been mixed with ſome acid. See ACID.

ACINARIA, in botany, a name ſometimes given to the marſh-whortle-berries. See WHORTLE.

ACINI, among botaniſts. See ACINUS.

ACINIFORMIS *Tunica*, in anatomy, the ſame with uvea. See UVEA.

ACINUS, in botany, a name given to grapes or berries growing in cluſters, in oppoſition to baccæ, or ſuch berries as grow ſingle.

ACKNOWLEDGMENT, in a general ſenſe, is the owning or confeſſing ſome thing; but more particularly denotes the reward of ſome ſervice, or the grateful requital of a favour received.

ACKNOWLEDGMENT-*Money*, a certain ſum paid by tenants in ſeveral parts of England, on the death of their landlords, as an acknowledgment of their new lords.

ACLIDES, in Roman antiquity, a kind of miſſive weapon, with a thong fixed to it, whereby it might be drawn back again.

Moſt authors deſcribe the aclides as a ſort of dart or javelin; but Scaliger makes it roundiſh or globular, with a wooden ſtem to poiſe it by.

ACME, in a general ſenſe, denotes the height, point, or top of any thing. Among phyſicians it is uſed for the higheſt pitch to which a diſtemper riſes.

ACME alſo denotes the prime or beſt part of a thing.

ACNUA, amongſt the ancient Romans, ſignified a certain determinate meaſure of land, equal to the Engliſh rood, or fourth part of an acre. See ROOD.

ACOEMETÆ, or ACOEMETI, a ſet of monks, who chaunted the divine ſervice night and day in their monaſteries, without intermiſſion; from which they were ſtiled ἀκοιμῆτοι, or men who lived without ſleep. We muſt not ſuppoſe however that they did in fact watch *always*, and pray *without ceaſing*: human nature could not ſupport ſuch inceſſant fatigue. They divided their body into three different choirs, who regularly ſucceeded and relieved each other, ſo that there was no interruption in the ſacred ſervice.

It is generally believed that Alexander, a monk of Syria, was the founder of this ſect, about the beginning of the fifth century. He firſt preached at Conſtantinople; but being obliged to quit that city, he built a monaſtery near the mouth of the Pontus Euxinus, where he died in the year 430. He was ſucceeded by John, and Marcellus, who having built the famous monaſtery near Conſtantinople, has been miſtaken for the inſtitutor of this order. Some years afterwards one Studius, a nobleman of conſular dignity at Rome, erected a monaſtery at Conſtantinople, which contained a thouſand perſons, and was highly celebrated for its piety and learning. He dedicated it to St. John, and called it from his own name Studium; whence the monks who lived in it gained the appellation of Studitæ.

This ſect was long famous for their exemplary piety; but in time they degenerated, and were at length condemned by the emperor Juſtinian, and pope John II. for favouring the hereſy of the Neſtorians.

There are a kind of Acoemetæ ſtill ſubſiſting in the Romiſh church; the religious of the holy ſacrament coming properly enough under that appellation, as they have adopted, from the Latin church, what was called the *laus perennis*, praying before the holy ſacrament, ſome or other of them, day and night.

ACOLUTHI, in antiquity, was a name given of old to the Stoics, who were remarkably tenacious of their principles, and were not to be ſhaken from their reſolutions.

The word is of Greek extraction, compounded of α priv. and κελευθος, way; as never deviating from the original courſe. In this ſenſe it has been applied to thoſe perſons who were firm and unmoveable in their opinions, be they what they would.

ACOLUTHI, in eccleſiaſtical hiſtory, is the name of the firſt four minor orders below the ſubdeacon.

The word is Greek, being derived from ἀκολουθος, that is, a ſervant. It was a very ancient order in the Latin church, being mentioned by Cyprian, but was unknown to the Greek. Their function in the church was to light the candles, and to bottle the wine that was for conſecration, as is remarked in the fourth council of Carthage, and in the ancient rituals; whence we learn, that when they were ordained, the archdeacon preſented them with a candle and a bottle, to ſignify to them the office they were to ſupply in the church. We find in the Martyrology, that they held ſometimes the

covered chalice at mass, which is now done by the subdeacon. They assisted too the bishops and officiating priests, in helping them to the sacerdotal habits.

There were in the Roman church three sorts of acoluthi: the palatini, who waited upon the pope; the stationarii, who assisted in the churches; and the regionarii, who helped the deacons in the functions which they exercised in different parts of the city.

ACONITE, in botany, a genus of plants commonly known by the name of wolfsbane and monkshood.

The petals of the flower consist of five unequal irregular leaves, formed so as to bear a great resemblance of a helmet, or hood, which in some species is very conspicuous; and from this particular the name of monkshood is taken. The common sorts are too well known to require any farther description.

All the species of aconite are extremely acrimonious, and thence too often occasion fatal convulsions, or inflammations, that terminate in a mortification.

ACONTIAS, in zoology, a species of serpent, otherwise called jaculum, or the dart-snake, from its vibrating its body in the manner of a dart. It is about nine or ten inches long, and of the thickness of a man's little finger. On the back it is of a milky grey colour, variegated with small black spots, and surrounded with a white circle, like so many eyes.

The neck is wholly black: and from it there run two milk-white streaks along the back to the tail. The belly is perfectly white. It is found in Egypt, and in the islands of the Mediterranean.

ACONTIAS is also used by naturalists for a kind of comet, or rather meteor, with a roundish or oblong head, and a long slender tail resembling a javelin, from whence it takes its name.

ACORES, in geography. See AZORES.

ACORN, the fruit of the oak. See the article OAK.

Acorns are said to have been the primitive food of mankind. They are astringent, and therefore esteemed good in fluxes. However, they are principally used at present, for fattening of hogs, poultry, &c.

ACORUS, in the materia medica, a name given to two very different roots, the galangal, and the calamus aromaticus. See GALANGAL, and CALAMUS AROMATICUS.

ACORUS *adulterinus*, or *Bastard* ACORUS, a name given by some botanists to the root of the yellow water-iris, or flag-flower.

ACOUSTICS, in mechanics, is the art of assisting the sense of hearing, by instruments contrived for that purpose, as hearing-trumpets, whispering-galleries, &c. for the construction of which, see those articles.

It is possible, by the help of an extended wire, to hear the beat of a watch more than a furlong, and that almost instantaneous; and Dr. Hook, in the preface to his Micrography, says, that he knew of a way by which it is easy to hear a person speak through a wall three feet thick.

The word is Greek, ακουστικα, and derived from ακουω, to hear.

ACOUSTIC *Duct*, in anatomy, a name sometimes given to the external passage of the ear, generally called meatus auditorius. See MEATUS AUDITORIUS.

ACOUSTIC *Instruments*, are instruments contrived to assist the hearing.

ACQUEST, or ACQUIST, in law, implies goods acquired by purchase or donation, in contradistinction to those descended by inheritance.

ACQUISITION, in a general sense, implies the obtaining or procuring something. But the lawyers use it to signify the right or title to the enjoyment and property of an estate procured by purchase.

ACQUITAL, in law, signifies the freeing a person from the suspicion of guilt; or the declaring a person innocent of the crime he is accused of.

ACQUITTANCE, a discharge in writing for a sum of money, witnessing that the person to whom it is given hath paid the same.

ACRE, in surveying, is an English superficial measure of land, containing ten square chains, of twenty-two yards each.

The French acre is equal to one and a quarter of the English, while that of Strasburg is only about half of the latter.

ACRID, an appellation given to such things as are of a sharp or pungent taste. Dr. Grew says, an acrid taste is compounded of pungency and heat.

ACRIMONY, that quality in things which renders them acrid. See ACRID.

ACROATIC was a denomination given by Aristotle to such lectures as were calculated only for his particular friends and disciples, being chiefly employed in demonstrating some speculative or abstruse part of philosophy.

The word is Greek, and derived from ακροαομαι, to hear.

ACROMATIC, or ACHROMATIC, in optics, is a term applied to a particular species of telescope, the most perfect of the refracting kind, and for the invention of which the late Mr. John Dollond obtained his majesty's letters patent for the sole disposal thereof. But though it be certain that Mr. Dollond was the first person who made any thing of this kind public, yet it is not quite so clear that he was the first who thought of it, or even put it in practice; as appears by a paper, written by the late Mr. James Ayscough, and given as a direction to Mr. Eastland, one of his workmen, and which

which is to the following effect: "A lens of "crown-glass, flat on one side, and convex on the "other, of two feet focus; and one of flint-glass, "flat on one side, and concave on the other, suf- "ficient, when combined with the former, to "make the focal distance three feet." This paper is dated 1752, which is a considerable time before Mr. Dollond made any thing of this kind public. The result is not known; but the reader may compare it with the following theory, which is agreeable to the patentee's construction.

Every ray of light, although it consists of an infinite number of component rays of different colours, is white during the time it is passing through the medium in which it is first generated; but in passing obliquely from that into a denser, it will change its direction toward the perpendicular, and at the same time be separated into its component rays, which from that time proceed on diverging from each other, like rays from a center, each of which will then appear of its own particular colour; as is evident in the phænomenon of the rainbow. This bending of the ray, called its refraction, is caused by a particular property in light called its refrangibility; and the divergency is caused by the different degrees of refrangibility in its component rays; and the more the original or compound ray is refracted, the greater will be the divergency of its component rays, when it is refracted by one given medium. See DIVERGENCY, LIGHT, RAY, REFRACTION, and REFRANGIBILITY.

Now from this property of light it has been concluded, that any two different mediums that can be made to produce equal degrees of refraction, will also produce equal divergencies; whence it should likewise follow, that equal and contrary refractions would not only destroy each other, but that the divergency in one would also be exactly counterbalanced by the other, and that to produce refraction without divergency is impossible. But those conclusions are not true; for it appears from numberless experiments, that a ray of light, after equal and contrary refractions, may be still subject to divergency, if refracted through different mediums; and also that different refractions may be produced, and yet the divergency in one exactly corrected in the other: as for example, if a prism (see PRISM) of white flint-glass, ABC, (see Plate III. *fig.* 1.) be taken, whose angle C is about 25°, and another CBD, of crown-glass, whose angle B is 29°, be joined to it, so as to refract in contrary directions, it will be found that a beam of light, SP, incident on the former at P, will, after it has been refracted through both prisms, pass on in a direction nearly the same as it did before it was refracted by the first; but at the same time, the divergency of its component rays will be very considerable, and any object on which it may fall will appear strongly coloured. Again, if the prism of white flint-glass be retained, and one of crown-glass, whose angle of refraction is to that of the white flint one nearly as 3 : 2, be added to it, it will then be found, that the divergency caused by the refraction in one, will be exactly counteracted by that of the other, but that there will still remain a considerable angle of refraction.

Now to determine the lens of a given focus, which shall produce the same effect with the given prism ABC or BCB, (see *Fig.* 1.) with CD = the given focal distance as a radius describe the semi-circle ABG, (Plate III. *fig.* 2.) and make the $\angle ACB = \frac{1}{2}$ the refracting angle in the given prism, and draw BC; also draw BI perpendicular to DC, and BA and BE tangents to the equal and similar arcs BD and BF. Now, since the angle ABC is a right angle $\therefore$ the triangles ABI, EBI, and ACB, are similar, and the $\angle$ ABI, EBI, and ACB equal, whence the prism ABE is similar to the given prism, and BI, the semi-aperture of the lens required.

For if we suppose a ray of light SB parallel to the axis of the lens AC, and incident on it at the extreme part B, it is evident that it will be refracted to the same point in the axis, viz. C, the center of the sphere, both in the prism and lens, since they there perfectly coincide; and it is well known from experiment, that parallel rays are refracted to the same point in the axis, let them fall on what part of the spherical surface they will. See APERTURE, FOCUS, LENS, and PRISM.

COR. Hence it is very evident (notwithstanding what may have been said to the contrary) that when DC is constant, the semi-aperture BI and arc BD (or BF) are so too; and consequently that the aberration arising from the spherical surface of the lens cannot be remedied without departing from the theory.

ACROMION, in anatomy, signifies the upper or superior part of the scapula, or shoulder-blade. See SCAPULA.

The word is formed from the Greek ακρος, the highest, and ωμος, the shoulder.

ACRONYCAL, in astronomy, is applied to the rising of a star above the horizon, or some other point of the heavens, at sun-setting; or its sinking below the horizon when the sun rises; in which case, the star, &c. is said to rise or set acronycal.

The word is Greek, ακρονυκος, and compounded of ακρον, extremity, and νυξ, the night.

The acronycal is one of the three poetical risings and settings of the stars; the other two are called *cosmical* and *heliacal*. See COSMICAL and HELIACAL.

ACROSPIRE, the popular term for what the botanists call the germ, plume, or plumule. See PLUMULE.

ACROSPIRED, in the art of making malt, implies that the grains of barley are shot or sprouted out at both ends. See MALT-MAKING.

ACROSTIC, the name of a kind of poetical compoſition, diſpoſed in ſuch a manner, that the initial letters of the verſes make up ſome perſon's name, title, motto, &c.

The word is compounded of the Greek ακρος, extreme, and στιχος, verſe.

ACROTERIA, in architecture, are little pedeſtals, uſually without baſes, anciently placed at the middle and two extremes of the pediments; and ſerving alſo to ſupport ſtatues, &c. The word is alſo ſometimes uſed to ſignify the figures which are placed as ornaments on the tops of churches; and thoſe ſharp pinnacles that ſtand in ranges about flat buildings, with rails and baluſters.

ACT, *Actus*, in a general ſenſe, implies the exertion or effectual application of ſome power or faculty.

It is diſtinguiſhed from power, as the effect from the cauſe, or as the thing produced from that which produces it.

ACT, among logicians, denotes an operation of the human mind, as judging, willing, abſtracting, &c.

ACT, among lawyers, is uſed to ſignify an inſtrument or deed in writing, ſerving to prove the truth of ſome bargain or tranſaction.

ACT is alſo uſed for the final reſolution or decree of an aſſembly, ſenate, council, &c.

ACT *of Faith*, *Auto da fe*, in the church of Rome, is the utmoſt exertion of prieſtly tyranny, being no other than a gaol-delivery, for burning, &c. the unhappy priſoners who have unfortunately fallen into the unrelenting and deſpotic power of the judges of the inquiſition.

ACT, in dramatic poetry, is a certain part or diviſion of a play, contrived to give a reſpite to the actors and the audience. Every juſt dramatic action ſhould conſiſt, according to Horace, of five diſtinct parts, dependent on each other. Theſe different portions of the poem are called acts, becauſe they may be conſidered as ſo many ſubordinate actions, which tend to the ultimate point in view. When they all run in one direct line, and ſucceed each other naturally, till they arrive at the propoſed end, then the action is ſimple, and without epiſode. It is otherwiſe, when there are collateral branches which are not united to the principal action till towards the end of the play; for in that caſe the plot is complex, and theſe are epiſodes. If they never join the common ſtream at all, but are entirely ſuperfluous, they are faulty, and have a bad effect; as they call off the attention of the ſpectators from the main deſign, and divide and weaken the diſtreſs. Such, for inſtance, are the love-ſcenes in the Tragedy of Cato, which may be lopt off entirely, without doing the leaſt damage to the main action of the poem.

The five acts have each their particular rules, which are neceſſary to be obſerved by every one who intends to form himſelf after the model of the ancients.

The firſt, which is called the *Protaſis*, becauſe it contains the propoſition of the ſubject, ought to explain the action of the drama in a plain and clear manner; it ſhould bring us acquainted with all the perſonages, and their characters; and ſhould lay a foundation for the denouement and unravelling the plot. I ſhall inſtance from the Tragedy of Oedipus by Sophocles, after juſt premiſing that the Greeks did not divide their plays by acts, but by choruſes, or interludes, which anſwer exactly the ſame purpoſe. At the opening of the play, the people requeſt the king to find ſome remedy for the evils they groan under. He tells them, he has ſent Creon to conſult the gods, and is every inſtant in expectation of his return. Creon enters with an apparent air of ſatisfaction, and informs them of the oracle's commands to puniſh the murderers of Laius: the king makes a reſolution to leave nothing undone towards the diſcovery of thoſe murderers.

We have here a clear expoſition of the ſubject: firſt, the diſtreſs of Thebes; ſecondly, the cauſe of her misfortunes; and thirdly, the remedy is propoſed, by which the evil is to be vanquiſhed.

The ſecond and third act ſhould be taken up in heightening the plot, and keeping the expectation and inquietude of the audience continually increaſing. This was called by the Greeks the *Epitaſis*. Thus in the Oedipus, act the ſecond and third, the king pronounces before-hand the edict againſt the murderer of Laius, and then exhorts his people to yield him all aſſiſtance in detecting the criminal, and bringing him to puniſhment. Juſt at that time arrives Tireſias the prophet, whom the king queſtions about the murderer, but he refuſes to anſwer. This throws Oedipus into a rage: at laſt Tireſias diſcovers to the king every thing that concerns him: Oedipus believes that it is a plot of Creon's, who was jealous of ſeeing a ſtranger, as he was, upon the throne, and wanted to ſucceed him: however, what Tireſias ſaid created the king no ſmall uneaſineſs. Creon endeavours to juſtify himſelf, but the king is enraged: Jocaſta comes in, and in order to make Oedipus quite eaſy, tells him not to credit Tireſias, for the oracle had foretold that Laius ſhould be killed by his own ſon, and that ſon had died ſoon after he was born: ſhe acquaints him moreover, that Laius had been murdered by thieves, in a place where three great roads met. Theſe laſt words, dropt without deſign, increaſe his uneaſineſs; he aſks freſh queſtions; he enquires into circumſtances, which ſerve to prove to him too clearly, that he is himſelf the author of the murder committed in that place. One thing remains to be ſolved, which is, the report that ſeveral were concerned in the murder of Laius, whereas Oedipus was alone when he did it: an officer

ficer of the houſhold, who was well acquainted with the circumſtances, is ſent for: in the mean while Oedipus relates to Jocaſta, that while he was at the court of Polybus, king of Corinth, he had one day been reproached with not being the ſon of that prince; and not having been able to get this point cleared up by the king, he conſulted the oracle at Delphos, which, inſtead of giving him a ſatisfactory anſwer, had told him that he ſhould kill his father, and marry his mother. In order to prevent this, he had reſolved never to ſee Corinth more, and in his way to Thebes, had met with ſuch a man as Laius was deſcribed, and killed him and ſome of his retinue; that when this happened, he was alone by himſelf; therefore, if Laius had been killed by a number of people in company, he certainly could not be the perſon that murdered him. Here we ſee all is in agitation and perplexity; the dreadful oracle begins in ſome meaſure to be accompliſhed againſt him, and we wait in trembling anxiety for the event.

The next rule is the *Cataſtaſis*, which carries on the intrigue, and heightens the diſtreſs that is raiſed in the *Epitaſis*, till at laſt the plot, being ripe for unravelling, leads to the *Cataſtrophe*. Thus the fourth act begins with Jocaſta in great diſorder preparing for a ſacrifice. A meſſenger arrives from Corinth, with an account of the death of Polybus. Jocaſta is partly appeaſed, as ſhe thinks the oracle has now proved falſe, at leaſt in one particular: ſhe ſends to acquaint Oedipus with the pleaſing news. He no longer dreads being the murderer of his father, but is ſtill in apprehenſion of becoming the inceſtuous partner of his mother's bed. The Corinthian, in hopes of ſilencing his fears, informs him that the queen of Corinth was not his mother, nor Polybus his father; and then relates to him the manner of his having received him an infant from the hands of a ſhepherd on mount Citheron. Oedipus perceives that this ſhepherd is the very ſame perſon he ſent for. Jocaſta, who is acquainted with all the remaining parts of the ſtory, is for preventing the king from enquiring further: he is determined to know the whole: the queen, unable to ſtand the fatal diſcovery, departs. The officer who was ſent for arrives, and a moſt dreadful ſcene enſues: every thing is diſcovered, by confronting the two ſhepherds. Oedipus finds himſelf guilty of all the horrid crimes which the oracle foretold; and nothing remains but to ſee the puniſhment inflicted on him. This leads directly to

The laſt rule of the drama, called by the Greeks the *Cataſtrophe*, which unravels the intrigue, and brings the play to a concluſion. Accordingly the fifth act opens with an officer, who relates what has paſſed in the palace: the queen has killed herſelf, and Oedipus, not having arms to take away his life, has dug out his eyes with one of the claſps of Jocaſta's robe, and is filling the palace with the moſt bitter lamentations: Creon enters and upbraids him, but at length he is permitted to take a laſt farewel of his children: after this he is conducted back to the palace, and ſo the piece ends.

From this analyſis of the Tragedy of Oedipus, we may collect the uſe of the choruſes or interludes, which, as was hinted above, anſwer the ſame purpoſes with the more modern diviſions of the drama, called acts. Theſe were invented by the Romans, to give a breathing-time to the actors and ſpectators: but we muſt not ſuppoſe that during the intervals between the acts, when the theatre remains empty, the plot ſtands ſtill: No; though there is no action viſible to the ſpectators, it is ſuppoſed all the while there is one paſſing out of ſight; ſo that it is not merely for the ſake of the reſpite that theſe acts are obſerved, but to give affairs a greater degree of probability, and render the plot more intereſting. For the ſpectator who ſees the action prepared that is to paſs in the interval, does not remain idle, but ſupplies in his imagination the part of the abſent actors: by which means he is agreeably ſurpriſed to ſee a new act come upon the ſtage, which is the reſult or natural conſequence, if I may ſo ſay, of what has been paſſing in his own mind.

It ſhould be the buſineſs of an author, to contrive that the moſt dry and difficult parts of the drama ſhould be tranſacted between the acts: juſt as the ancients endeavoured to throw the narrative and unentertaining parts of their plays into the choruſes.

Horace has determined the number of acts to be five: but ſuch a rule ſeems to be drawn rather from cuſtom, than the reaſon of the thing. An author ſhould be governed entirely by the ſubject that he chuſes: and if this is of ſuch a kind, that it cannot be drawn out into five acts without embarraſſing it with epiſodes, or loading it with incidents foreign to the buſineſs; he had better confine it within three or four acts, than ſuffer a ſlaviſh obſervance of rule to get the better of nature and propriety.

The acts are divided into ſcenes, and Voſſius remarks that among the ancients, an act never contained more than ſeven ſcenes: it is eaſy to perceive that they ſhould not be too numerous, as a proportion ſhould be kept up between the length of each act; but there can be no rule as to the exact number, which ſeems to be arbitrary.

ACTS *of the Apoſtles*, one of the ſacred books of the New Teſtament, which was placed among the canonical books at the council of Laodicea, and has been acknowledged ſuch by every church without controverſy. It contains the hiſtory of the infant church during the ſpace of 29 or 30 years; that is, from the aſcenſion of our bleſſed

Saviour Jesus Christ, till about the 63d year of the Christian æra.

It is generally supposed to have been written by St. Luke, from its being addressed to Theophilus, and making mention of his Gospel, in which he had set forth the actions and doctrines of Christ till his ascension. He here resumes the thread of his history, and gives us an account of the ministry of the apostles and growth of the church. This book contains the accomplishment of many promises made by our Saviour; his resurrection and ascension; the descent of the Holy Ghost on the apostles, and the wonderous change it wrought on their hearts and manners; their preaching, and the miracles they performed in confirmation of it; their zeal and prudence in the government of the church at Jerusalem; the concord, disinterestedness, and charity of the first Christians; in short, every thing that happened in the church till the apostles separated themselves, to sow the seed of salvation throughout the whole world. From that period St. Luke dropt the history of the other apostles, from whom he was removed, and attached himself to that of St. Paul, who had chosen him for the companion of his labours and travels. Him he followed, the chosen vessel of the church, in all his missions, and even to Rome itself: for it appears, that the Acts of the Apostles were published the second year of St. Paul's residence in that city, that is, in the sixty-third year of Christ, and the 9th or 10th of the emperor Nero. The stile of this work, which was composed in Greek, is more pure than that of the other canonical books; and one may remark that St. Luke was better skilled in the Greek than the Hebrew language, as his quotations of the Old Testament are always taken from the Septuagint version.

Several different works have been published under the title of the Acts of the Apostles, of which the first was the acts of Paul and Thecla, written by a disciple of St. John, for which he was degraded. Afterwards the Manicheans forged a work, called the Acts of St. Peter and St. Paul, which were full of their errors. They make the apostles say, that the souls of men and beasts are the same, and work miracles to make dogs and sheep talk: other writings of this kind are, the Acts of St. Andrew and St. John, the Voyage of St. Peter, the Translation of St. Paul, with several more too tedious to mention.

ACTIAN *Games*, *ludi Actiaci*, in antiquity, were games instituted by Augustus, in commemoration of the victory he gained over Marc Antony at Actium.

Some will have it that they were celebrated every third year; but Strabo, whose authority is now generally followed, tells us, that they returned every fifth year only, and that they were sacred to Apollo, thence called Actius.

ACTIAN *Years*, a series of years commencing from the battle of Actium. See EPOCHA.

ACTION, *actio*, in a general sense, implies nearly the same with act. See ACT.

ACTION, as applied to epic poetry, is that which makes the subject or the matter of the poem: in the dramatic, we call it more properly plot or fable. See DRAMA, PLOT, FABLE.

The five following qualifications seem essential to the epic action: it should be *single*, *great*, *marvellous*, *probable*, and *affecting*, or *interesting*.

First, It should be single: for if two actions were to be carried on at once, both of them equally interesting, the heart would be divided, and all its emotions would be vague and uncertain; if they were not equally interesting, that which was the least so, would be tiresome and palling; from which it follows, that unity is essential to the epic action. Hence we may collect that the life of a hero, which comprizes a vast variety of actions, can never be the proper matter of a regular poem: and that for several reasons; first, because it is too diffused to be taken in at one view; secondly, because all the parts of it are not equally heroic; and thirdly, because they do not necessarily depend on each other, nor tend to one common end.

But it may be asked, what it is that makes the action of a poem single. Is it the unity of the hero? Certainly not; for the Iliad comprizes a whole people. Is it the superior excellence of any one particular hero? That cannot be; for if Achilles excelled in valour, Ulysses excelled no less in prudence, Nestor in wisdom, and Agamemnon in authority. How shall we then define it? The action is single when it is independent of every other action, and when all its parts are connected in a natural manner with each other. This unity of action is known from the very proposition of the subject itself: thus Virgil says, I sing the hero who, after a thousand toils, settled at length in Italy. Here it is plain that the action of Æneas is the conquest of Italy, and the establishment of his people in a foreign land. If he had said, I sing the despair of Dido; though in that case his poem would have contained but one single book, it would still have been a compleat work: or if he had said, I sing the descent of Æneas into hell, the funeral obsequies of old Anchises, or the fatal adventure of Nisus and Euryalus; in each of these cases the action of his poem would have been entire, though consisting at most of but five or six hundred verses. But saying as he did, I sing the hero who settled in Italy; every obstacle this hero had to surmount, before he was established in his kingdom, became part of the poet's subject; and every adventure he met with, that had any connection with the main action, might be introduced

duced as epiſodes, to refreſh the mind of the reader by an agreeable variety. See EPISODE.

The next point to be conſidered is the greatneſs of the epic action: a common and ordinary adventure does not furniſh from its own ſtock either matter ſufficiently intereſting, or ſuch a fund of uſeful inſtruction, as we ought to meet with in an epic poem. Nothing leſs than a hero, who is the favourite of the gods; or the reduction of a famous city; or the conqueſt of a kingdom; or the common fate of mankind, is worth the conſideration of the epic muſe. The life of an ordinary perſon, or a trivial ſtory, or a love intrigue, may furniſh matter for a hiſtory, a novel, or aromance; but an epic poem, which ſtrains every nerve of the human genius, ſhould attempt nothing but what is big with grandeur and magnificence.

But it is not enough that the action of an epic poem be *great*, it ſhould alſo be *marvellous*. Petronius ſays, *Per ambages Deorumque miniſteria, fabuloſumque ſententiarum tormentum præcipitandus eſt liber ſpiritus.* "Through all the intricate mazes "of fate, conducted by the miniſtering gods, "the wild unfettered genius of the poet muſt "dart, and bring his machinery from the vaſt un-"bounded ſpace of fiction." It is the buſineſs of an epic poem to raiſe our admiration and aſtoniſhment. If we look into Homer, the great father of this ſpecies of poetry, we are all at once wrapt in amazement: Jupiter thunders on mount Ida; we ſee gods and goddeſſes mingle in a croud of mortal combatants, covered with duſt and heavenly ichor. How warmly are they intereſted! what ſurprizing revolutions do they occaſion, attacking and overcoming each other! Virgil trod in the ſteps of this mighty maſter: nothing is tranſacted in the Æneid, without the interpoſition of ſome deity: the gods are every where! Juno traverſes the air; the monarch of the winds lets looſe the bellowing tempeſt; all is uproar and confuſion, until Neptune the god of ocean riſes, and drives back the winds to their caverns. It ſeems from the frequent uſe which is made of theſe divine agents, that an epic poem could not exiſt without machinery of this nature, which gives to the moſt trifling and common incident of life an air of the marvellous. I would not here be ſuppoſed to mean, that an epic poem could not be formed without the aſſiſtance of heatheniſh deities. No; if in the hands of Homer ſuch admirable uſe could be made of the pagan mythology, which is a ſyſtem only of abſurdities; how much more noble and ſublime a machinery would a poet of equal genius frame from the chriſtian religion! With what energy, what maſterly force, would he paint the God who created the univerſe with a word, who rides on the wings of the wind, and ſees and comprehends every thing at a glance? How delightful muſt it be to follow ſuch a poet, while with a ſoul inflamed with *prophetic* fire, he deſcribes his hero imagining, attempting, and executing the grandeſt exploits; always under the direction of ſome miniſtring angel, ſome guardian ſpirit, which gives him prudence to foreſee, fortitude to encounter, and patience and courage to ſurmount every obſtacle in his way! See MACHINERY.

The fourth qualification eſſential to the epic action, is that it ſhould be *probable*: for though it ſeems neceſſary in a poem of this nature to make uſe of the agency of ſuperior beings to produce effects aſtoniſhing and ſupernatural, yet they ſhould never be employed in matters that contradict any known truths, or even received opinions. The poet declares himſelf inſpired by a genius, who aſſiſts at the council of the gods; and therefore may fairly be allowed to lay open the unknown ſprings of great operations. But he never does it in ſuch a manner as ſhocks probability; he ſhews us ſuch things as reſemble thoſe we believe, and relates them with an air of authority and reſolution. The reſolution ſhakes, and the probability of the thing convinces us. We behold heroes, actions, manners, painted in characters we underſtand; we forgive the fiction, nay, we even forget it, through an amiable deluſion that poſſeſſes us. But this would be impoſſible, if the characters were unnatural, or his repreſentations exceeded the bounds of probability: in ſuch caſes we ſhould laugh, as we do at Homer himſelf, when he makes a river quit his bed to purſue a man, and Vulcan run armed with fire to force the river back again to its channel.

The laſt thing that is neceſſary to the epic action is, that it ſhould be intereſting: this may be effected two ways, one, by the nature of the action and its object, and the other, by the nature of the obſtacles to be ſurmounted: the former is called the affecting; the latter excites our curioſity, and is therefore called the ſingular.

The affecting comprehends ſeveral ſorts of intereſts; as firſt, a national intereſt; thus a Roman intereſts himſelf in the undertaking of Æneas, as being a Roman: ſecondly, a religious intereſt; a chriſtian intereſts himſelf in the undertaking of Godfrey of Bulloigne to deliver the ſepulchre of Jeſus Chriſt out of the hands of the infidels: thirdly, a natural intereſt, or the intereſt of humanity, "Homo ſum, humani nihil a me alienum "puto:" thus we all intereſt ourſelves warmly in the diſtreſs of ADAM, not only as he is a man, but as he is the father of all mankind, in whoſe welfare every individual is concerned as a principal. Where theſe different kinds of intereſts can be blended and joined together, the action cannot fail to affect and captivate us. The laſt of theſe is by far the ſtrongeſt and moſt prevalent; and Milton has choſen ſuch a ſubject, in which we

are

are concerned both for ourſelves and others, and managed it with ſo much art and addreſs, that he will be for ever read and felt, even though the days of monkiſh barbariſm ſhould again return, when Homer and Virgil will be ſuffered to moulder into duſt, neglected and forgotten!

We are told by Ariſtotle that the epic action ſhould have a beginning, a middle, and an end; which precept F. Boſſu has explained in the following manner: The beginning, ſays he, comprehends thoſe cauſes that influence the action, and the reſolution that ſome perſon takes to perform it; the middle is the effect of thoſe cauſes, and the difficulties which attend their being carried into execution; and the end is the unravelling and ceſſation of thoſe difficulties. The unravelling may be brought about two ways, either by diſcovery, or without it by a revolution. This is called a peripetia; which if it happen by a diſcovery, the peripetia is twofold; if by a revolution, it is ſingle.

ACTION, in oratory, means the outward deportment of the orator, or an accommodation of his countenance, voice, and geſture, to the ſubject of which he is treating. Cicero emphatically terms it, the eloquence of the body: and it was ſo much eſteemed by Demoſthenes, that when he was aſked, what was the principal perfection of an orator? He anſwered, Action. What the ſecond? Action. What the third? Action. As if the matter of the diſcourſe was of trivial conſequence, ſo that it was only well delivered. Indeed he ſeems to have ſpoken thus with ſome reaſon, as action is a direct attack upon the ſenſes, which are as it were the inlets to thoſe ideas that more immediately affect the paſſions. For this cauſe it has been condemned by many ſober and judicious perſons, as inverting the natural order of things, dragging our reaſon after our paſſions, which ſhould ever go before them.

It is impoſſible to lay down any rules to aſcertain the proper modes and degrees of action, which can be *univerſally* juſt and accurate; becauſe every nation has ſome particular ſigns of its own to expreſs particular paſſions, and no two nations agree in the direct quantity of action that can be made uſe of with propriety. What in Italy is decent and becoming, would be regarded in France as extravagant and preporterous; and what with them is lively and ſpirited, is looked upon in England as downright grimace and buffoonery. Yet notwithſtanding this, there are ſome geſtures that are univerſally underſtood, and ſeem to be the language of nature herſelf; even ſo far that the very brutes are affected by them. The face, according to Quintilian, is able to expreſs every movement and paſſion of the ſoul; it threatens, careſſes, and ſupplicates; is ſorrowful, gay, and humble. Nay, the very eyes with him are a never failing ſource of eloquence; they are the windows of the ſoul, through which we ſee whether ſhe ſparkles with joy, or is clouded with ſorrow: they are bright with pleaſure, glare with indignation, are depreſſed with ſhame, roll in anger, and are tender and bathed with tears in pity.

It is much to be lamented that action is ſo generally diſuſed in diſcourſes from the pulpit; which are for the moſt part frigid lectures of divinity, delivered and heard without the leaſt marks of feeling, either in the preacher or the audience. It would be highly abſurd to introduce into the pulpit all the variety of theatrical geſtures; but at the ſame time there is a certain degree of action, properly regulated, which might be made uſe of with the happieſt ſucceſs; as not unlikely to influence thoſe who have ſhut their ears againſt the voice of reaſon.

ACTION, in ethics, implies ſomething done by a free or moral agent, capable of diſtinguiſhing good from evil.

The eſſence of a moral action conſiſts in being done knowingly and voluntarily: that is, the agent muſt not only be able to diſtinguiſh whether it be good or bad in itſelf, but he muſt likewiſe be entirely free from compulſion of any kind, and at full liberty to follow the dictates of his own underſtanding. Hence the actions of ideots, ſlaves, &c. cannot be called moral. Hence alſo appears the abſurdity of fataliſm, becauſe it deſtroys the very foundation of morality.

ACTION, in mechanics and phyſics, in ſome authors, ſignifies the preſſure or percuſſion of one body againſt another: or, according to others, the effect itſelf of ſuch preſſure.

It is abſolutely neceſſary, in order to reaſon juſtly upon any ſubject, to have a juſt and determinate idea of it; and as this word is become ambiguous, and uſed both in a ſimple and complex ſenſe, it was neceſſary to give this double definition of it: but its proper ſignification ſeems to imply the motion which a body really produces, or tends to produce in another; or in other words, that which it would have produced, had nothing hindered its effects.

For it may be conſidered, that we can have no demonſtrative evidence of the action of bodies upon one another but their motion; and as the mind can have no preciſe idea of a cauſe, but from the effect which it produces, it would therefore be abſurd to prefix any idea to the word action, except that of actual motion, or a tendency thereto. Had Leibnitz and his followers but thoroughly conſidered this, it is very probable we ſhould never have heard of the famous controverſy concerning the *vires vivæ*, which ſeems to have aroſe entirely from a miſconception of this nature.

Quantity of ACTION, a name given by M. de Maupertuis, in the Memoirs of the Parisian academy of sciences for 1744, and in those of Berlin for 1746, to the product of the mass of a body, into the space which it runs through, and into its celerity. He there lays it down as a general law, "That in the changes made in the "state of any body, the quantity of action ne-"cessary to produce such change is the least "possible." This principle he applies to the investigation of the laws of refraction, equilibrium, and even to the laws of acting of the supreme Being.

In the same year that M. de Maupertuis communicated the idea of this principle, professor Euler printed a work, entitled, *Methodus inveniendi lineas curvas maximi vel minimi proprietate gaudentes*; in the supplement to which he has made an application of this principle to the motion of the planets.

It appears from the Memoir of 1744, that it was reflections on the laws of refraction which first led M. de Maupertuis to the theorem here spoken of. The principle on which M. de Fermat, and after him M. Leibnitz, accounted for the laws of refraction, by supposing that a particle of light in passing from one point to another, through two different mediums, in each of which it moves with a different velocity, must do it in the least time possible, and from whence they demonstrated by geometry, that the particle cannot go from one point to the other in a right line, but that when it arrives at the surface which separates the two mediums, it must alter its direction in such a manner, that the sine of its incidence shall be to the sine of its refraction, as its velocity in the first medium is to its velocity in the second; and from whence also they deduced the well-known law of the constant ratio of their sines, is very ingenious; but notwithstanding, M. de Maupertuis saw it was liable to one great objection, which is, that the particle must approach towards the perpendicular in that medium where its velocity is the least, and consequently resists it the most, which is contrary to all the mechanical explanations of the refraction of bodies that have hitherto been given, and of the refraction of light in particular.

Now Sir Isaac Newton's way of accounting for it is much more satisfactory, and gives a clear reason for the constant ratio of the sines, by ascribing the refraction to the attractive power of the mediums; whence it follows, that the densest mediums, whose attraction is the strongest, should cause the ray to approach towards the perpendicular, a fact confirmed by experiment. Now the attraction of the medium could not cause the ray to approach the perpendicular, without increasing its velocity, as may easily be demonstrated; and M. de Maupertuis has attempted to reconcile it with metaphysical principles in the following manner.

Instead of supposing, as the aforesaid gentlemen do, that a particle of light proceeds from one point to another in the shortest time possible; he will have it, that a particle of light passes from one point to another in such manner, that the *quantity of action* shall be the least possible. This quantity of action, says he, is a real expence, in which nature is always frugal; and in virtue of this philosophical principle, he discovers that not only the sines are in a constant ratio, but that they are also in the inverse ratio of their velocities; agreeable to Sir Isaac Newton's explanation, and not in the direct ratio, as Messieurs de Fermat and Leibnitz had supposed.

It is very remarkable that of the many philosophers who have written on refraction, none should hit upon this thought; for it is but making a small alteration in the calculus founded on M. de Fermat's principle, viz. That the space divided by the velocity should be a minimum: for calling the space run through in the first medium S with the velocity V; and the space run through in the second medium s with the velocity v, we shall have $\frac{S}{V} + \frac{s}{v}$ a minimum, its fluxion $\frac{\dot{S}}{V} + \frac{\dot{s}}{v} = 0$; whence it is easy to perceive, that the sines of incidence and refraction are to each other as $\dot{S}$ to $-\dot{s}$ ∴, it follows that those sines are in the direct ratio of V : v, which is what M. de Fermat makes it to be: but in order to have those sines in the inverse ratio, it is only supposing that $S \times V + s \times v$ is a minimum, which gives $V\dot{S} + v\dot{s} = 0$. See MINIMUM and FLUXION.

In the Memoirs of the academy of Berlin above-cited, may be seen all the other applications which M. de Maupertuis has made of this principle; and whatever shall be determined with regard either to his metaphysical basis, or the conception he has annexed to the quantity of action, it will still hold good, that the product of the space by the velocity is a minimum, in the most general laws of nature.

ACTION, in the animal œconomy, is a motion or alteration produced in the whole body, or in some part of it, and differs from function in this, that the latter is only a faculty of producing, whereas action is that faculty reduced into an act. *Boerhaave.*

ACTIONS, as well as functions, are distinguished into vital, natural, and animal: the vital actions are those which are of an absolute necessity for life; such as the motion of the heart, respiration, &c. Natural actions are those whereby the body is preserved such as it is; such are digestion, the secretions, nutrition, &c. The animal actions are those which produce a certain alteration in

the ſoul, and on which it hath ſome power; ſuch are the motion of the muſcles ſubmitted to the will, ſenſations, &c. See FUNCTION, *Animal*, *Natural* and *Vital*.

ACTION, in medicine, is ſaid in the ſame ſenſe as function; and therefore we ſay, that the action of the ſtomach upon aliments is to divide them and mix them intimately together. A phyſician ought to be acquainted with the action of all the parts of the human body, and to diſtinguiſh the cauſe, ſeat, and differences of diſeaſes; this knowledge puts him in a ſituation of pronouncing with certainty, either in reſpect of the danger that the patient is in, or of the proximity of his recovery. See FUNCTION.

The word action is likewiſe medicinally uſed inſtead of force: we augment the action of a purgative, by adding ſomething to it, that is to ſay, we give it more force.

ACTION, in the military art, is an engagement between two armies, or between different bodies of troops belonging thereto. The word is likewiſe uſed to ſignify ſome memorable act done by an officer, or commander of a body of troops.

ACTION, in law, is a judiciary demand, founded upon a title or law, whereby the plaintiff ſummons the defendant to ſatisfy him for that to which he is obliged, in virtue of the one or the other, and for defect whereof he requires that he ſhould be condemned by the judge.

ACTIONS are divided by Juſtinian into two general kinds, real, or thoſe againſt the thing; and perſonal, or thoſe againſt the perſon; for whoever brings an action, either does it againſt one obnoxious to him in reſpect either of contract or of offence; in which caſe ariſe actions againſt the perſon, which require the party to do or give ſomething; or he does it againſt one not obnoxious, yet with whom a controverſy is riſen touching ſome matter; as if Caius holds a field, which Julius claims as his property, and brings his action for the ſame. See the INSTITUT. *L.* 4. *tit.* 4. where the principal actions introduced by the Roman law are ſummarily explained.

There is alſo a third kind of action which ariſes out of the two former claſſes of real and perſonal actions, and which is called a mixed action.

Real ACTION is that whereby the plaintiff ſues for the right which he has to lands, tenements, rents, or other payments; and of this there are two ſorts, either the poſſeſſion or demand. An action is merely real when it ſingly attacks the thing, and the detainer is clear upon giving it up; but if he is perſonally obliged to the reſtitution of fruits or intereſt, in that caſe it is mixed.

Perſonal ACTION is that which one man has againſt another, in conſequence of a contract, whereby he is obliged to pay or do ſomething; or by reaſon of an offence done by him, or by ſome other perſon for whoſe fact he is anſwerable. See PERSONAL.

In the firſt caſe the action is civil, and in the other it is or may be criminal.

Mixed ACTION is that which is either laid againſt the perſon of the detainer of the thing, or for the thing detained, being thus called, becauſe it hath a mixed reſpect, both to the thing and to the perſon.

They generally reckon three ſorts of mixed actions, the action of partition between coheirs, of diviſion between aſſociates, and limitations between neighbours.

ACTIONS are alſo divided into civil, penal, or criminal: the civil action is that which tends only to the recovery of that which belongs to a man, by virtue of a contract, or of ſome ſuch like cauſe; as if any one ſhould endeavour to recover, by way of action, a ſum of money which he has lent.

Penal or *criminal* ACTION tends to the puniſhment of the party accuſed or proſecuted, either corporally or pecuniarily.

ACTION *of a writ*, is where a perſon pleads ſome matter, whereby he ſhews that the plaintiff hath no juſt cauſe to have the writ he brought, though it be poſſible he might have a writ or action for the ſame matter; ſuch plea is called a plea to the action of the writ. See WRIT.

ACTION, in commerce, ſometimes ſignifies moveable effects; and we ſay, that the merchant's creditors have ſeized upon all his actions, inſtead of ſaying, that they have put themſelves in poſſeſſion, and rendered themſelves maſters of all his active debts.

ACTION, in painting and ſculpture, is the attitude or poſition of the parts of the face and body of ſuch figures as are repreſented, and whereby we judge that they are agitated by paſſions: they ſay, This figure by its action finely expreſſes the paſſions with which it is agitated; This action of a man in a fright is very well. They make uſe of the ſame term in reſpect to animals; they ſay, There is a dog, whoſe action very well expreſſes fury; and of a ſtag at bay; There is a ſtag, who by his action expreſſes his grief, &c.

ACTIVE, in a general ſenſe, implies ſomething that communicates motion or action to another, in which acceptation the term active ſtands oppoſed to paſſive.

ACTIVE, a term in grammar, which denotes a word that has an active ſignification, or expreſſes an action.

Verbs active, according to ſome grammarians, are diſtinguiſhed into three kinds: firſt, *tranſitive*, where the action paſſes into a ſubject different from the agent, as Antony loved Cleopatra: ſecondly, The *reflected*, or verb *neuter*, which has no noun

following it, becauſe the action returns upon the agent, as I walk, I think, &c. and thirdly, The *reciprocal verb*, which is uſed only in ſome modern languages, where the action turns mutually upon the ſeveral agents who produced it, as in French, *Jacque et toi vous vous louez:* "James and you commend each other, or one another."

In the Greek and Latin languages, the active and paſſive voice have each their diſtinct terminations in the different moods and tenſes: but in all modern languages, the paſſive voice is expreſſed by the participle paſt joined to an auxiliary verb, as, I am loved. See PARTICIPLE, AUXILIARY, &c.

ACTIVE *principles*, in chemiſtry, thoſe which act of themſelves without any foreign aſſiſtance. Theſe are ſuppoſed to be mercury, oil, and ſalt; phlegm and earth are called paſſive principles.

ACTIVITY, in a general ſenſe, ſignifies the faculty or power which renders things active.

Sphere of ACTIVITY, the whole ſpace in which the virtue, power, or influence of any object is exerted.

ACTŒA, in botany, a name given by Linnæus to a plant, formerly called Chriſtophoriana by Tournefort, or herb Chriſtopher. It produces a roſaceous flower compoſed of four petals; the filaments are numerous and hairy, topped with round and upright antheræ; it has no ſtyle, but the germen, which is oval and placed in the center, is crowned with an oblique compreſſed ſtigma. When the flower is decayed, its oviary becomes a globular berry conſiſting of one cell, containing four ſeeds, whoſe outſides are round, but angular where they are joined. The common ſort, called bane-berries, grows plentifully in ſome parts of Yorkſhire: but the other ſpecies of this plant are natives of America, one of which called black ſnake-root, is uſed as an antidote againſt the bite of the rattle-ſnake.

ACTOR, in a general ſenſe, ſignifies a perſon who acts or performs ſomething.

ACTOR, as to the drama, ſignifies a perſon who repreſents ſome part or character upon the theatre.

The drama conſiſted originally of nothing more than a ſimple chorus, who ſung hymns in honour of Bacchus. Theſpis was the firſt who introduced a *perſona* or actor; which he did for two reaſons, one, to give a kind of reſpite, or breathing-time to the ſingers, and the other, to explain ſome particular circumſtances which related to their heroes, and without which ſeveral paſſages in their hymns would not eaſily be underſtood. Æſchylus, finding a ſingle perſon tireſome, ventured to introduce a ſecond; and ſo changed the ancient recitals into dialogues. It was he who firſt invented the buſkin, which was a high ſhoe, that encreaſed the ſtature, and gave the wearer an heroic appearance.

Sophocles improved further upon this plan; and finding the two perſons of Æſchylus not ſufficient for the variety of incidents, added a third: and here the Greeks ſtopped; at leaſt we do not find in any of their tragedies above three perſons in the ſame ſcene. In their comedies, they allowed themſelves greater licence.

If we conſider ſome particular circumſtances and cuſtoms that prevailed on the ancient theatre, we cannot help ſuppoſing that the actors truſted rather to the matter of the play, than their manner of performing it, for the entertaining and affecting their audience. In the firſt place they acted in maſks, for which reaſon they were called *perſonæ:* now it was impoſſible for them to expreſs any emotion of the ſoul by the muſcles of the face, which is the moſt eloquent part of the body, while it was thus concealed from the ſpectators. To remedy this inconvenience, when the actor was to vary the paſſion, he wore a maſk that was painted, on one ſide the face, for inſtance, to repreſent joy, and on the other grief: and when there was occaſion to make a tranſition from one paſſion to the other, he gave himſelf a dexterous turn, and exhibited the oppoſite profile.

Another thing, which to us at leaſt appears highly ridiculous, is, that on the Roman ſtage one actor frequently ſpoke the part, and another gave it a proper accompanyment of action and geſture.

Actors were highly honoured at Athens, and deſpiſed at Rome; where they were not only denied all rank among the citizens, but even when a citizen appeared upon the ſtage, he was expelled his tribe, and deprived of the right of ſuffrage by the cenſors. The French have in ſome meaſure adopted the ſame ideas with the Romans; but we, more humane and polite, thoſe of the courtly Athenians.

ACTUAL, an epithet applied to ſuch things as exiſt fully and abſolutely. Thus philoſophers ſpeak of actual heat, cold, &c. in oppoſition to virtual or potential.

ACTUARIÆ *naves*, in antiquity, a kind of ſhips among the Romans, deſigned chiefly for expedition.

ACUBENE, in aſtronomy, the Arabic name of a ſtar of the fourth magnitude, in the ſouthern forceps of cancer; by Bayer marked *a*. See the conſtellation CANCER.

ACUPUNCTURE, a method of curing ſeveral diſorders among the Chineſe and Japoneſe. It conſiſts in making a great number of punctures in the part affected with a gold or ſilver needle.

ACUS, in ichthyology, the name of two diſtinct genuſes of fiſhes; the one called the acus of Ariſtotle,

Ariſtotle, and the other the acus of Bellonius. The former is generally called in Engliſh the needle-fiſh, and the latter the gar-fiſh.

ACUTE, an epithet applied to ſuch objects as terminate in a ſharp point or edge; in which acceptation it is oppoſed to obtuſe.

ACUTE *Angle*, in geometry, is that which is leſs than a right-angle, or ninety degrees. See ANGLE.

ACUTE-*angled Cone*, is a right cone, whoſe axis makes an acute angle with its ſides.

ACUTE-*angled Triangle*, in geometry, is that whoſe angles are all acute: it is otherwiſe called an oxygonous triangle. See TRIANGLE.

ACUTE *angular ſection of a cone*, an expreſſion made uſe of by the ancient geometricians, to ſignify the ellipſis. See CONE, and ELLIPSIS.

ACUTE *Accent*, in grammar. See ACCENT.

ACUTE, in muſic, is applied to a tone or ſound that is ſharp or high, in reſpect to ſome other tone. In this ſenſe it ſtands oppoſed to grave.

ACUTE *Diſeaſes*, among phyſicians, imply ſuch as move with velocity towards a criſis, and are attended with danger. In this ſenſe the word acute is oppoſed to chronic.

AD, in grammar, a Latin prepoſition, frequently uſed in the compoſition of words in the Engliſh as well as the Latin language. Sometimes the *d* is ſuppreſſed, and ſometimes changed into another letter.

ADAGE, a ſhort ſentence, or proverb, containing ſome wiſe remark, or uſeful obſervation.

We have a collection of Greek and Roman adages, by Eraſmus, and another of Engliſh proverbs, by Mr. Ray.

ADAGIO, an Italian adverb, ſignifying ſlowly, leiſurely; and is uſed in muſic, to ſignify the ſloweſt of all times, except the grave. It is ſometimes repeated, as adagio, adagio, and then ſignifies a ſtill greater retardation of the time than when uſed ſingly.

ADAMANT, a name ſometimes given to the diamond. See DIAMOND.

ADAMI *Pomum*, Adam's apple, in anatomy, a prominence in the fore part of the throat; ſo called from an idle conceit that a piece of the forbidden fruit ſtuck in Adam's throat, and occaſioned this tumor; though it is in reality nothing more than the convex part of the firſt cartilage of the larynx. See LARYNX.

ADAMICA *Terra*, adamic earth, a name given to the common clay, from a ſuppoſition of its being the adamah, or ruddy earth, out of which the firſt man was formed.

Some writers call the ſlimy ſubſtance found at the bottom of the ſea by the name of *Adamica terra*.

ADAMITES, the name of a ſect of ancient heretics, who are mentioned by Epiphanius, and after him by St. Auſtin and Theodoret: they are ſuppoſed to be a branch of the Baſilidians and Carpocratians. It is much diſputed amongſt the learned at what time this ſect firſt ſprang up, and who was its author. Some affirm, that it began in the ſecond century of the church, and that its inſtitutor was Prodicus, a diſciple of Carpocrates: but it appears from Tertullian, and Clement of Alexandria, that his followers never had the name of Adamites, though they profeſſed the ſame errors.

However this might be, they took the name of Adamites, according to Epiphanius, from their pretending to be reinſtated in primitive innocence, like Adam at his firſt creation, whoſe nakedneſs they thought themſelves obliged to imitate. They deteſted marriage, affirming that the conjugal union had never been known but for ſin; and that the privilege of enjoying women in common belonged to thoſe who like them were reinſtated in original purity. However incompatible theſe tenets were with chaſtity, they all of them pretended to vaſt continence, and declared that if any of their followers fell into carnal ſins, they would chaſe him from their aſſembly, as Adam and Eve were driven out of paradiſe for eating the forbidden fruit. They looked upon themſelves as ſo many Adams and Eves, and their temple as paradiſe: a ſtrange paradiſe indeed, which was nothing but a ſubterraneous cavern, into which they entered ſtark naked, men and women; and as ſoon as ever their chief had pronounced aloud, "Increaſe and multiply," committed the moſt ſcandalous actions, even adultery and inceſt! They had not even regard to common decency, but openly in the face of the ſun imitated the beaſtly impudence of the ancient Cynics. They boaſted that they were poſſeſſed of the ſecret books of Zoroaſter, for which reaſon they have been ſuſpected by ſome of practiſing magic arts.

This deteſtable ſect did not at firſt continue long, but ſtarted up afreſh in the twelfth century, under one Tandamus, ſince known by the name of Tanchelin. They appeared again in the fifteenth century, under one Picard, who pretended that he was ſent into the world as another Adam, to reeſtabliſh the law of nature, which, according to him, conſiſted in going naked, and having all the women in common. They aſſembled, like the votaries of the *Bona Dea* (only that there were men as well as women) by night, and like them too had their ſecrets and myſteries. One of the fundamental maxims of their ſociety was contained in the following verſe:

Jura, perjura, ſecretum prodere noli.

Some learned men have thought that this ſect is very ancient, and trace them up as high as the followers and votaries of the heathen god Priapus.

ADANSONIA, in botany, a tender kind of gourd,

gourd, said to come originally from Ethiopia. It consists of a flower whose cup is monophylous; the petals are five in number, round and fleshy; the filaments are numerous, surrounding a long tubulous crooked style; and the fruit is a hard oval shell, covered with down, which contains seeds similar to chocolate nuts, and of a dusky colour.

ADAPTERS, in chemistry, are hollow vessels, of an oblong form, perforated at each extremity, for connecting the receiver to the nose of the retort, alembic, &c.

ADAR, the name of a Hebrew month, which answers to part of our February and March: it is the twelfth of their sacred, and the sixth of their civil year.

On the seventh of this month the Jews celebrate a fast, in commemoration of the death of Moses.

They do the same on the thirteenth, which they call the fast of Esther; and on the fourteenth they hold the feast of Purim, to celebrate their deliverance from the cruelties of Haman by means of Esther.

As the lunar year, which the Jews have been used to follow in their calculations, is shorter than the solar by eleven days, they insert at the end of every three years an intercalary month of twenty-nine days, which they call Veader, or the second Adar.

ADARCE, in the ancient materia medica, was a kind of salt concreted about reeds and other vegetables in form of incrustations.—It was applied externally in various cutaneous disorders, as a detergent and dissolver.

ADARTICULATION, a term used by some writers in anatomy, for what is more generally called arthrodia, and diarthrosis.

ADERAMIN, in astronomy, the Arabic name of a star of the third magnitude, in the left shoulder of Cepheus, marked α by Bayer. See the constellation CEPHEUS.

ADDER, in zoology, a name sometimes given to the viper. See VIPER.

ADDERS-TONGUE, *Ophioglossum*, in botany. See OPHIOGLOSSUM.

ADDER-WORT, in botany, the same with bistort, or snake weed. See BISTORT.

ADDICE, or ADZE, a kind of crooked ax used by shipwrights, carpenters, coopers, &c.

ADDITION, in a general sense implies the uniting or joining several things together; or, the adding something to another.

ADDITION, in arithmetic, is the first of the four fundamental or principal rules of that science, whereby we are taught to find a *sum* equal to several small ones.

In setting down the numbers to be added, care must be taken to place every figure in its proper place, that is, units under units, tens under tens, &c. Then will the reason of the work appear very evident from this undeniable maxim, viz. *that all the parts are equal to the whole.* And the method of setting down the total may easily be accounted for from the nature of numeration, which explains the different value of places, as they proceed from the right to the left-hand; for as 9 is the greatest simple character or figure, so every number exceeding 9, being compound, must require more places than one to express it.—Thus the number ten can no otherwise be expressed in figures but by removing the figure 1 into the place of tens, which is done by supplying the units place with a cypher; and as it is the same with every other column (ten being still the proportion of increase) consequently when the sum of any column amounts to 10 or more, the units exceeding, if there be any, or a cypher, if none, must be set under such column, and the ten or tens carried on as so many units to the next column on the left-hand; for example, suppose we were to add the numbers 47, 397, and 687, together, they must be placed in the following manner, one under another:

47
397
687

1131

Having thus placed the above numbers, draw a straight line under them, and beginning at the place of units, add all the figures together in that column, putting their sum under the said straight line; as in this example, say, seven and seven make fourteen, and seven make twenty-one; wherefore, put one under the line in units place, and carry two for the two tens to the next column, and then proceed, saying, two that I carry and eight is ten, and nine is nineteen, and four make twenty-three, set down three under the line in tens place, and carry two to the next column; then say, two and six is eight, and three make eleven, which, because it is the last column, put down eleven, and the work is done.

ADDITION *of different denominations.* When the numbers are of different denominations, or when they contain, for example, pounds, shillings, pence, and farthings; tons, hundreds, quarters, pounds, &c. care must be taken to place the given numbers in such order under each other, that each column, from top to bottom, may consist of one and the same value, as pence under pence, shillings under shillings, and pounds under pounds.——Having first drawn a line under the columns, add them together, considering how many of each smaller make an unit of the next that is superior to it, (always observing to begin at the least denomination) and for every such unit carry one to the next superior denomination, that is, for every 4

in the farthings, you muſt carry one to the pence; for every 12 in the pence column carry one to the ſhillings column; and for every 20 contained in the ſhillings, carry one to the pounds, and the odd farthings, pence, and ſhillings, put under their proper columns below the line, as in the following examples.——Let it be required to add together, 146*l.* 16*s.* 7¼*d.* 274*l.* 10*s.* 11¾*d.* 567*l.* 17*s.* 10½*d.* and 78*l.* 11*s.* 6¼*d.* Firſt ſet them down one under the other, in the following manner, and draw a line as before directed.

£.	s.	d.
146	16	7¾
274	10	11¾
567	17	10½
78	11	6¼
1067	17	0¼

Firſt begin with the leaſt denomination, which is farthings, and add them together, ſaying ¼ and ½ is ¾, and ¾ is 6, and ¾ make 9, which is 2 pence and one farthing over, which ſet down under farthings below the line, and carry the 2 to the pence; then ſay, 2 and 6 is 8, and 10 is 18, and 11 is 29, and 7 make 36, which is 3 ſhillings, and nothing over; therefore put down nothing under the pence column, and carry 3 to the ſhillings; then ſay, 3 and 11 is 14, and 17 is 31, and 10 is 14, and 16 is 57, which makes 2 pounds, and 17 ſhillings over; put down the 17 ſhillings under ſhillings, and carry 2 to the pounds, ſaying 2 and 8 is 10, and 7 is 17, and 4 is 21, and 6 make 27, which is 2 tens, and 7 over; therefore put down a 7 under the units place of the pounds, and carry 2 to the tens, and ſay, 2 and 7 is 9, and 6 is 15, and 7 is 22, and 4 is 26; put down the 6, and carry 2 to the next column, ſaying, 2 and 5 is 7, and 2 is 9, and 1 is 10, which place down under the line in ſuch a manner that the cypher may ſtand under the laſt column of the pounds, and the 1 to the left-hand, and the work is done.——Note, that whatſoever ſums are to be added together, whether of money, weights, meaſures, &c. when you come to the greateſt denominations, as you caſt up the ſeveral columns thereof, you are to carry the tens of every preceding column to that which follows.

ADDITION *of Decimal Numbers* does noways differ from that of integers, due care being taken to place the particular ſums ſo that the firſt place of the integral or decimal parts be exactly under each other, as is ſeen in the following example:

4789,73
5684,94
3415,63
28,48
13918,78

Cyphers on the right-hand of a decimal number ſignify nothing, and are therefore more elegantly omitted; thus,

Inſtead of	We write
47.080	47.08
56.700	56.7
4.506	4.506
4.120	4.12
112.406	112.406

See the article DECIMALS.

ADDITION *of Vulgar Fractions.* When the fractions to be added have one common denominator, add the numerators together for a new numerator, and place it over the given common denominator; thus ⅛, ⅜, and ⅝, when added together, make ⅞, or ¾: but when amongſt the given fractions there are either compound ones, or ſingle with different denominators, they muſt be prepared by reduction before they can be added. See FRACTIONS, and Reduction of FRACTIONS.

ADDITION, in algebra, is performed by connecting the quantities to be added with their proper ſigns or character of + and —, and uniting or joining together thoſe which are ſimilar and capable of it. See SIMILAR, ALGEBRA, and CHARACTER.

The difficulty in algebraic additions, will chiefly ariſe from the ſigns + and — made uſe of in them; but only conceive, that what + affirms — denies, or what the firſt alledges or brings, the ſecond annuls and takes away; if + makes a tradeſman worth ſuch a ſum, — deprives him of it again: let us ſuppoſe a perſon has in poſſeſſion 20 pounds, and that he owes 10 pounds, then it is plain that his real worth is only 10 pounds; ſo in algebra, + 20 added to — 10, the ſum will be equal to 10. Addition of algebra may be reduced to the following rules:

RULE I.

When the letters, called quantities, are the ſame, and have the ſame ſign prefixed, add the quantities together, and to the ſum prefix the common ſign.

Example 1.	Example 2.	Example 3.
$a = 4$	$-b = -2$	$a - b = 4 - 2$
$3a = 12$	$-5b = -10$	$3a - 5b = 12 - 10$
$4a = 16$	$-6b = 12$	$4a - 6b = 16 - 12$

Numbers repreſented by the ſame letter in any operation, are ſuppoſed to be of the ſame value, and thoſe by different letters of different values: thus in example third, the letter *a* repreſents 4, and *b* repreſents 2; again the figure or number, prefixed to any letter or quantity, (called its co-efficient) ſhews how often that quantity is to be taken; thus, 3*a* ſhews that the quantity repreſented by *a* is to be taken 3 times, and when a quantity ſtands without a co-efficient, it is always underſtood to have

have an unit prefixed. Quantities which differ only in their co-efficients, (as a, $3a$ and $5a$) are said to be like or similar, but $3a$ and $5b$ are unlike, and not similar. Quantities which ſtand without any prefixed ſign before them, are always underſtood to have the ſign + before them: thus, $3a$ and $+3a$, both repreſent the ſame thing.

Rule II.

When the quantities are like, but have different ſigns; ſubſtract the co-efficient of the leſſer from that of the greater, and to the difference, if any prefix the ſign of the greater, adjoining the letter or letters, common to each quantity.

Example 4.	Example 5.	Example 6.
$-a=-7$	$b=11$	$5b-a=55-7$
$3a=21$	$-4b=-44$	$-2b+3a=-22+21$
$2a=14$	$-3b=-33$	$3b+2a=33+14$

Rule III.

When the quantities are unlike, ſet them in order with their proper ſigns prefixed.

Example 7.	Example 8.	Example 9.
$a+b$	$4x-5y$	$7z-x-a$
$a-c$	$2n-z$	$7z-d+c$
$2a+b-c$	$4x+5y+2n-z$	$14z-x-a-d+c$

Additon of algebraic fractions is performed by the ſame rules as numerical fractions, they being firſt reduced to one denomination, and their loweſt terms. See Fractions.

Addition of ſurd, or irrationals. In theſe operations we have two caſes.

Case I.

When the ſurds quantities are alike, add the rational parts, or thoſe which are without the radical ſign, if they are joined to any, and to their ſum join their ſurd.

Example 1.	Example 2.
$7x\sqrt{ab}$	$5y\sqrt{dm-y}$
$5x\sqrt{ab}$	$y\sqrt{dm-y}$
$12x\sqrt{ab}$	$6y\sqrt{dm-y}$

Case II.

When the ſurd quantities are unlike, they are only to be added by their ſigns, and from thence will ariſe compound ſurds.

Example 3.	Example 4.
$\sqrt{bx}$	$m\sqrt{da+y}$
$\sqrt{bz}$	$m\sqrt{z}$
$\sqrt{bx}+\sqrt{bz}$	$m\sqrt{da+y}+m\sqrt{z}$

In the laſt example, the letters under the radical ſigns being different, firſt put down $m\sqrt{da+y}$, and becauſe the quantity $m\sqrt{z}$, has the ſign +, therefore after $m\sqrt{da+y}$ put the ſign +, after which put the quantity $m\sqrt{z}$, and we have $m\sqrt{da+y}+m\sqrt{z}$.

Addition of logarithms. See Logarithms.

Additions, among diſtillers, a general name for ſuch things as are added to the waſh or liquor while fermenting, in order to increaſe the vinoſity and quantity of the ſpirit, or to give it a particular flavour.

Additions, in law, denote all ſorts of deſignations given to a perſon, over and above his proper name and ſurname, &c.

Theſe additions are ordained to prevent one man's being grieved or moleſted for another; and that every perſon might be certainly known, ſo as to bear his own burden.

If a man is of different degrees, as duke, earl, &c. he ſhall have the moſt worthy; and the title of knight, or baronet, is part of the party's name, and therefore ought to be rightly uſed; whereas that of eſquire, or gentleman, being as people pleaſe to call them, may be uſed or not, or varied at pleaſure.

An earl of Ireland is no addition of honour here; nay, the law-addition to the children of Britiſh noblemen is only that of eſquire, commonly called lord.

Writs without the proper additions, if excepted to, ſhall abate; only where the proceſs of outlawry doth not lie, additions are not neceſſary. The addition of a pariſh, not in any city, muſt mention the county, otherwiſe it is not good.

Addition *of ratios*, the ſame with what is otherwiſe called compoſition of ratios. See Compoſition and Ratio.

Addition, in muſic, a dot marked on the right ſide of a note, to ſignify that it is to be ſounded or lengthened half as much more as it would have been without ſuch mark. See Note, and Character.

ADDITIONAL, in a general ſenſe, denotes ſomething over the uſual ſum or quantity.

Additional *Duties*, thoſe charged upon certain commodities, over and above what were formerly obliged to be paid.

ADDITIVE, in a general ſenſe, ſignifies ſomething to be added: mathematicians ſpeak of additive ratios, aſtronomers of additive equations. See the articles Ratio, and Equation.

ADDRESS, in a general ſenſe, denotes the nice management of an affair, or the tranſacting it with great propriety and ſkill.

Address is, more particularly, uſed for a ſpeech made to the king, in the name of ſome conſiderable body of men, by way of congratulation, petition, or remonſtrance.

Addreſſes

Addreſſes of parliament were firſt ſet on foot under Oliver Cromwel.

ADDUCENT *Muſcles*, among anatomiſts, the ſame with thoſe more uſually called adductors. See ADDUCTOR.

ADDUCTION, *Adductio*, among anatomiſts, denotes the action of the muſcles called *adductores*. See ADDUCTOR.

ADDUCTOR, in anatomy, a general name for all ſuch muſcles as ſerve to draw one part of the body towards another. Thus,

ADDUCTOR *brachii* is a muſcle of the arm, ſerving to bring it towards the trunk of the body.

ADDUCTOR *indicis*, a muſcle of the fore-finger, which draws it towards the thumb.

ADDUCTOR *oculi*, a muſcle of the eye, directing its pupil towards the noſe; and otherwiſe called *bibitorius*, for a like reaſon.

Anatomiſts reckon up ſeveral other abductors, as the *adductor pollicis*, the *adductor pollicis pedis*, *adductor minimi digiti pedis*, *adductor proſtatæ*, &c.

ADELPHIANI, in church hiſtory, a ſect of heretics, who always faſted on Sundays.

ADEMPTION, *ademptio*, among civilians, denotes the revocation of ſome donation or favour.

The ademption of a legacy may be done either in expreſs terms, or indirectly, by diſpoſing of it otherwiſe.

ADENOGRAPHY, *αδενογραφια*, that part of anatomy which treats of the glands. See GLAND.

ADEPS, in anatomy, denotes the fat found in the abdomen; differing from the common fat, or *pinguedo*, as being thicker, harder, and of a more earthy ſubſtance.

ADEPS, among phyſicians, is uſed in a more general ſenſe, for all kinds of animal fat: theſe they preſcribe for their ripening quality.

ADEPTS, the name given to the proficients in alchemy, particularly thoſe who pretend to have found out the philoſophers ſtone, and the panacea, or univerſal medicine.

Alchemiſts will have it, that there are always twelve adepts; the places of thoſe who die being immediately ſupplied by others of the fraternity.

ADEQUATE, in a general ſenſe, ſomething exactly correſponding with another. Thus,

ADEQUATE *Ideas* are thoſe which perfectly repreſent all the parts and properties of the object. See IDEA.

In this ſenſe, the idea of a figure bounded by a curve line, which returns into itſelf, and whoſe parts are all equally diſtant from a certain point in the middle, is an adequate idea of a circle.

All ſimple and abſtracted ideas are adequate ones, becauſe they repreſent objects as they really are: whereas thoſe of ſubſtances are inadequate, in regard our knowlege of ſubſtance is extremely defective.

ADESSENARIANS, *Adeſſenarii*, a ſect of Chriſtians, who maintain that Jeſus Chriſt is really preſent in the euchariſt, though not by way of tranſubſtantiation.

The Adeſſenarians differ among themſelves, ſome of them holding, that the body of Jeſus Chriſt is in the bread; others, that it is about the bread; others, that it is with the bread; and others, that it is under the bread. See EUCHARIST.

ADFECTED *Equations*, or affected, in algebra; thoſe wherein the unknown quantity is found to riſe to two or more different powers: for example, $z^3 + az^2 - bz = a^2q$, in which there is found three different powers of z, that is, z^3, z^2 and z. See EQUATION.

The term *affected* is ſometimes likewiſe uſed in algebra, when ſpeaking of quantities which have co-efficients. Thus in the quantity $3x$, x is ſaid to be affected with the co-efficient 3.

It is likewiſe ſaid, that an algebraic quantity is affected with the ſign + or —, or with a radical ſign $\surd$; meaning that it has the ſign + or —, or that it includes a radical ſign $\surd$. See CO-EFFICIENT and RADICAL.

ADHESION, in phyſics, the ſtate of two bodies joined or faſtened together by mutual attraction, the interpoſition of their own parts, or the impulſe or preſſure of external bodies. Muſchenbroeck in his *Eſſai de Phyſique*, has given a great many remaks on the *adheſion* of bodies, and relates various experiments which he had made on this matter; the chief of which concern the reſiſtance of ſeveral bodies to fracture, in virtue of the adheſion of their parts; which adheſion he aſcribes, principally, to their mutual attraction. Common experiments prove the mutual adheſion of the parts of water to each other, as well as to the bodies they touch. The ſame may be ſaid of the particles of air, on which M. Petit has a memoir, among thoſe of the academy of ſciences at Paris, for the year 1731. Some authors ſeem not diſpoſed to admit, that the adheſion of the parts of water, on indeed of bodies in general, is to be attributed to the attraction of their parts, and they reaſon thus: Suppoſe, ſay they, attraction to act at the diſtance of a line from a particle of water, about this particle deſcribe a circle whoſe radius is one line; the particle of water will not be attracted but by the particles which are included within the circle, and as theſe particles act in contrary directions, their mutual effects muſt deſtroy one another, and there can be no attraction of the particle, ſince it will have no more tendency one way than the other. See ATTRACTION *of Coheſion*.

ADHESION, among logicians, denotes the maintaining ſome tenet, merely on account of its ſuppoſed advantage, without any poſitive evidence for its truth.

ADHESION, in medicine and anatomy. There are frequent inſtances of the adheſion of the lungs to the pleura and diaphragm, which occaſions many diſorders. We alſo read of adheſions of the inteſtines, of the dura mater to the cranium, &c.

ADIANTIUM, in botany, maiden-hair. See MAIDEN-HAIR.

ADIAPHORISTS, or *Adiaphorites*, in church hiſtory, names given to the moderate Lutherans, in the ſixteenth century.

The name imports lukewarmneſs, or indifference; being compounded of the privative α, and διαφορος, different.

ADJACENT, in geometry, whatſoever lies immediately near each other: an angle is ſaid to be adjacent to another angle, when the one is immediately contiguous to the other, ſo that they both have one common ſide. This term is more particularly uſed when the two angles have not only one common ſide, but alſo when the two other ſides form one right line. See ANGLE, and SIDE.

ADJECTIVE is a term made uſe of in grammar, and comes from the Latin word *adjectus*, *added to*, becauſe it is always joined to the noun ſubſtantive, either expreſſed or underſtood, to ſhew its qualities or accidents.

Some perſons have improperly called the following words ſubſtantives, viz. the ſublime, the grand, the beautiful, &c. They are uſed indeed ſubſtantively; but ſtill are only adjectives, employed to expreſs that idea of ſublimity, grandeur, and beauty, which is raiſed by ſome ſubſtance, or agent. It was in the ſame manner that the Greeks and Latins made uſe of adjectives of the neuter gender inſtead of ſubſtantives: but then in this caſe the ſubſtantive was always underſtood; as in the following examples, μητι η πηγη εκ της αυτης οπης βρυει το γλυκυ και το πικρον; where it is evident that υδωρ is underſtood: and in the following paſſage of Horace,

---------- miſcuit utile dulci,

χρημα, or part, is to be ſupplied.

The definition which F. Buffier gives of adjectives is by no means a bad one, though ſomewhat different from other grammarians: nouns, according to him, are ſubſtantives, when the objects which they repreſent are conſidered ſimply and in themſelves, without any regard to their qualities: on the contrary, they are adjectives when they expreſs the quality of an object. Thus when we ſay ſimply a king, the word king is a ſubſtantive, becauſe none of its qualities are expreſſed; but when we ſay a pious king, or a virtuous king, or a good king, theſe words pious, virtuous, and good are adjectives, becauſe they expreſs ſo many qualities in the king. See NOUN SUBSTANTIVE, &c.

AD INQUIRENDUM, in law, a writ commanding inquiry to be made about ſomething connected with a cauſe depending in the king's courts; as of baſtardy, for inſtance.

ADJOURNMENT, in law, the putting off a court or meeting to another time or place. Thus,

ADJOURNMENT *in Eyre*, is the appointment of a certain day, when the juſtices in eyre are to meet again.

ADJOURNMENTS *of Parliament* differ from prorogations, in being not only for a ſhort time, but alſo in regard each houſe has the privilege of adjourning itſelf. See PROROGATION.

ADIPOSE, in a general ſenſe, denotes ſomething belonging to the fat of the body.

The term adipoſe is chiefly uſed by phyſicians and anatomiſts, in whoſe writings we read of adipoſe cells, adipoſe ducts, adipoſe membrane, adipoſe veſſels, &c. See CELL, DUCT, &c.

ADIT, *Aditus*, in a general ſenſe, ſignifies the paſſage to, or entrance of any thing. Thus we read of an adit of a mine, adit of a theatre, adit of ſhips, &c. See MINE, THEATRE, &c.

ADJUNCT, *Adjunctum*, among philoſophers, ſomething added to another, to which it does not naturally belong: thus water in a ſponge is an adjunct to it; ſo are clothes to a man.

Adjuncts are what we commonly call circumſtances: theſe, in ethics, are commonly reckoned ſeven, *quis*, *quid*, *ubi*, *quibus auxiliis*, *cur*, *quomodo*, *quando*.

ADJUNCTS, in rhetoric, a denomination given to all words added with a view to increaſe the force of the diſcourſe: ſuch are adjectives, attributes, epithets, &c.

ADJUNCT is alſo uſed for a colleague, or aſſiſtant. Thus,

ADJUNCT GODS, in heathen theology, were a kind of inferior deities, whoſe office it was to aſſiſt the ſuperior gods: ſuch were Mars, Bellona, and Nemeſis accounted.

AD JURA REGIS, in law, a writ which lies for a clerk preſented to a living by the king, againſt thoſe who endeavour to eject him, to the prejudice of the king's title.

ADJUTAGE, or *Ajutage*, in hydraulics, is a tube fitted to the mouth of a jet-d'eau, through which the water is played, or directed into any deſired figure; ſo that the great variety of fountains is chiefly owing to the different ſtructure, &c. of their adjutages.

Mr. Mariott, who was very converſant in theſe things, gives the following proportions of the bores of the adjutages and pipes of conduct, dividing the inch into 12 equal parts, which he calls lines.

Height of the reſervoirs.	Diameters of fit Adjutages.	Diameter of the pipes of conduct.
Feet	Lines	
5 ——	3, 4, 5, or 6	22
10 ——	4, 5, or 6 -	25
15 ——	5 or 6 - -	27
20 ——	6 - - -	30
25 ——	Ditto - -	33
30 ——	Ditto - -	36
40 ——	7 or 8 - -	51
50 ——	8 or 10 - -	65
60 ——	10 or 12 - -	72
80 ——	12 or 14 - -	87
100 ——	12, 14, or 15	96

There is a certain and juſt proportion to be obſerved between the adjutage, whereby the jet is delivered, and the pipe conducting it from the head. In general about five times the diameter of the adjutage for jets under half an inch, and ſix or ſeven times for all above, will ſize the pipes of conduct pretty well.

In reſervoirs of the ſame altitude, and adjutages of different diameters, the expence of water is proportionable to the ſquares of the diameters of the adjutages. But in reſervoirs of different altitudes, the exceſs of the expence of water from greater heights more than in ſmaller is in the ſubduplicate ratio, or as the ſquare roots of the altitudes; from whence we have the two following tables:

TABLE I.

	Feet	Pints
Adjut.	1 ——	$1\frac{1}{4}$
	2 ——	$6\frac{2}{9}$
	3 ——	14
	4 ——	25
	5 ——	29
	6 ——	56
	7 ——	$76\frac{1}{2}$
	8 ——	$110\frac{2}{3}$
	9 ——	126

TABLE II.

Height	6 ——	10
	8 ——	$11\frac{1}{2}$
	9 ——	$12\frac{1}{2}$
	10 ——	$12\frac{5}{6}$
	12 ——	14
	15 ——	$15\frac{3}{4}$
	18 ——	17
	20 ——	$18\frac{1}{2}$
	25 ——	$20\frac{5}{6}$
	30 ——	$22\frac{1}{16}$
	35 ——	24
	40 ——	$24\frac{2}{3}$
	45 ——	$27\frac{5}{6}$
	48 ——	28

It is ſhewn from experiment, that 14 Paris pints of water will be delivered in a minute from an adjutage of three lines diameter, when the height of the reſervoir above the orifice is 12 feet; which may be taken as a fundamental rule for fountains aſſiſted with the foregoing principles. Likewiſe obſerve, that the foregoing tables of Mr. Mariott's of the expences of water are calculated for one minute of time; and ſhould the expence of two reſervoirs of unequal heights and different adjutages be required, uſe the following rule:

The expence of water of two reſervoirs whoſe altitudes are different, and alſo their adjutages, are in the compound ratio of the ſquares of the diameters of the adjutages, and of the ſubduplicate ratio of the heights. See the article FOUNTAIN.

ADJUTANT, in the military art, an officer whoſe buſineſs it is to aſſiſt the major, and therefore ſometimes called the aid-major. See MAJOR.

Each battalion of foot, and regiment of horſe, has an adjutant, who receives the orders every night from the brigade-major; which, after carrying them to the colonel, he delivers out to the ſerjeants.

When detachments are to be made, he gives the number to be furniſhed by each company, and aſſigns the hour and place of rendezvous. He alſo places the guards, receives and diſtributes the ammunition to the companies; and, by the major's orders, regulates the price of bread, beer, &c.

ADJUTANT is ſometimes uſed by the French for an aid-du-camp. See AID-DU-CAMP.

ADJUTANTS-*General*, among the Jeſuits, a ſelect number of fathers, who reſide with the general of that order: they have each a province, or country, aſſigned them, as England, Germany, &c. and their buſineſs is to inform the father-general of ſtate occurrences in ſuch countries.

ADJUTORIUM, among phyſicians, is uſed for a medicine preſcribed along with another more efficacious one; and, particularly, for an external application, after the proper uſe of internal medicines.

ADJUTORIUM, in anatomy, a name ſometimes given to the humerus, or ſhoulder-blade. See HUMERUS.

ADMEASUREMENT, in law, a writ for adjuſting the ſhares of ſomething to be divided. Thus,

ADMEASUREMENT *of Dower* takes place, when the widow of the deceaſed claims more as her dower than what of right belongs to her. And,

ADMEASUREMENT *of Paſture* may be obtained, when any of the perſons who have right in a common paſture, puts more cattle to feed on it than he ought.

ADMINICLE, *adminiculum*, in our old law-books, is uſed for aid, help, or ſupport.

ADMINICLE, in the French juriſprudence, ſignifies the beginning or firſt ſketch of a proof.

ADMINICLES, among antiquarians, denote the attributes or ornaments wherewith Juno is repreſented on medals.

ADMINICULATOR, in church-hiſtory, an officer otherwiſe called advocate of the poor. See ADVOCATE.

ADMI-

ADMINISTRATION, in a political ſenſe, denotes, or ought to denote, the attendance of the truſtees of the people on public affairs; but, more particularly, adminiſtration is uſed for the executive part of the government, which is ſaid to be good or bad, according as the laws are duly enforced, and juſtice done the ſubjects. See GOVERNMENT.

ADMINISTRATION, in law, the office of an adminiſtrator. See ADMINISTRATOR.

Whenever a man dies inteſtate, letters of adminiſtration are taken out in the prerogative court.

ADMINISTRATION is alſo uſed for the management of the affairs of a minor, lunatic, &c.

ADMINISTRATOR, in law, the perſon to whom the goods, effects, or eſtate of one who died inteſtate are entruſted; for which he is to be accountable, when required.

The biſhop of the dioceſe where the party dies, is regularly to grant adminiſtration: but if the inteſtate has goods in different dioceſes, he is to be accountable for them, when required.

The perſons to whom adminiſtration is granted are a huſband, wife, children, whether ſons or daughters, the father or mother, brother or ſiſters, and in general the next of kin, as uncle, aunt, couſin; then to a creditor.

An action lies for and againſt an adminiſtrator, as for and againſt an executor; only that he is accountable no farther than to the value of the goods.

ADMINISTRATRIX, a female, or woman who acts as adminiſtrator. See ADMINISTRATOR.

ADMIRAL, *Admiralius*, or *Admirallus*, a great officer who ſuperintends the naval armaments of a kingdom, and has the determination of all cauſes in the marine.

There has been great variety of opinions with regard to the origin and denomination of this important office; which ſeems to have been eſtabliſhed in moſt countries lying near the ſea. Some have borrowed it from the Greek, others from the Arabic, while a third ſort, with more appearance of reaſon, derive both the title and dignity from the Saracens. But as no certain concluſions ſeem to have been hitherto deduced from theſe elaborate reſearches, and ſince it is not our province to give an hiſtorical or chronological detail of the difference of rank and power with which admirals have been inveſted in different nations, we ſhall decline to fatigue our readers with an enquiry ſo fruitleſs and foreign to our purpoſe; and inſtead thereof, preſent them with a real account of the office and duty of admirals at ſea, as well as of the Lord high Admiral of England, the former of which ſeems to have been entirely neglected, probably for a very ſufficient reaſon, by the gentlemen who have hitherto furniſhed us with theſe critical inveſtigations.

Lord high ADMIRAL *of England*, ſtiled in ſome ancient records, *capitanus maritimarum*, an officer of great antiquity and truſt, who has the entire management of the royal navy, and formerly had the deciſion of all maritime caſes, civil and criminal; he judged of all things done at ſea, or abroad by Britiſh mariners, and thoſe with whom they might be connected; upon the ſea-coaſts, in all ports and havens, and upon all rivers below the firſt bridge from the ſea. By him the inferior admirals, captains, and lieutenants are commiſſioned; all deputies for particular coaſts appointed, and coroners to view dead bodies found on the ſea-coaſt, or at ſea: he alſo appoints the judges for his court of admiralty, and may impriſon, &c. All ports and havens are *infra corpus comitatus*, and the lord admiral hath no juriſdiction of any thing done therein. Between high and low water mark the admiral and common law have juriſdiction alternately, one upon the land, and the other upon the water. The admiral hath likewiſe power to arreſt ſhips in harbours, &c. and during the voyage every commanding officer, ſoldier, or other, are to obſerve the orders of the lord admiral on pain of death, or other puniſhment.

The lord admiral has power to arreſt all Britiſh ſeamen, and detain them for the ſervice of the ſtate, after which they become immediately ſubject to military laws in caſe of deſertion. To him belongs all penalties and amercements of all tranſgreſſions at ſea, on the ſea ſhore, in ports and havens, and all rivers, below the firſt bridge from the ſea; the goods of pirates and felons condemned or enſlaved; ſea-wrecks, goods floating at ſea, or caſt aſhore; alſo all great fiſhes, commonly called royal fiſhes, except whales and ſturgeons: to which we may add a ſalary of 7000 l. a year.

In the time of Edward I. and king John all cauſes of merchants and mariners, and things ariſing on the main ſea, were tried before the lord admiral; by all which, and other laws, the power of the admiral is not only declared, but the original from whence it is derived, namely, from the legiſlative power of the parliament, and not from the ſingle perſon of the king, or any other council whatever.

This office is indeed ſo great in point of truſt, honour, and profit, that it has ſeldom been inveſted in any other than princes of the blood, or the moſt eminent perſons among the nobility. For ſome years we have had no high admiral, the office being put in commiſſion, or under the adminiſtration of the lords commiſſioners of the admiralty, who by ſtatute have the ſame power and authority as the lord high admiral. When he embarks, the flag of the anchor and rope is immediately diſplayed.

ADMIRAL *of the Fleet*, the higheſt officer under the command of the lord high admiral: he is diſtinguiſhed

ſtinguiſhed by hoiſting the union flag at the main-top-maſt head. Admiral alſo implies the comman derof any ſingle fleet or ſquadron, or in general any officer whatſoever who carries his flag at the main-top-maſt head.

The admiral or flag officer is to acquaint the ſecretary of the admiralty of all his proceedings relating to the ſervice, for the information of the lord high admiral, or lords commiſſioners of the admiralty. It is his duty, when at ſea, to arrange the ſhips under his command into lines or ranks of battle, as often as convenient, in order to exerciſe the officers and crew in the diſcipline of naval war; every ſhip being diſtinguiſhed by a particular ſignal diſplayed on board of the admiral. He is often to viſit the other ſhips of his ſquadron, and ſee the men muſtered, that no ſupernumeraries may be borne on the books. He is to aſſiſt at all councils of war that relate to naval affairs, and to attend the lord high admiral on his return home, with an account of his expedition or voyage, and tranſmit a copy of his journal to the ſecretary of the admiralty. See LINE, SIGNAL.

Vice ADMIRAL, the officer next in rank and command to the admiral. He carries his flag at the fore-top-maſt head.

Rear ADMIRAL, the officer next in rank and command to the vice. He carries a flag at the mizen-top-maſt head.

There are at preſent in England, beſides the admiral of the fleet, four admirals of the white ſquadron, and three of the blue; four vice admirals of the red, five of the white, and ſix of the blue ſquadron; four rear admirals of the red, five of the white, and five of the blue ſquadron; beſides twenty-nine rear admirals that have carried no flag, ſuperannuated, on half-pay.

Vice ADMIRAL, is alſo an officer appointed by the lords commiſſioners of the admiralty. There are ſeveral of theſe officers eſtabliſhed in different parts of Great Britain, with judges and martials under them, for executing juriſdiction within their reſpective limits. Their deciſions however, are not final, an appeal lying to the court of admiralty in London.

ADMIRAL, in natural hiſtory, is the name of a beautiful ſhell of the voluta kind, greatly admired by the curious.

There are four ſpecies of this ſhell diſtinguiſhed by the names of grand-admiral, vice-admiral, orange-admiral, and extra-admiral. The firſt is extremely beautiful, of an elegant white enamel, variegated with bands of yellow, which, in ſome meaſure, repreſent the colours of the flags in ſhips of war. It is of a very curious ſhape, and finely turned about the head; but its diſtinguiſhing character is a denticulated line running along the center of the large yellow band; and this diſtinguiſhes it from the vice-admiral, though the head of the latter is alſo leſs elegantly formed.

The orange-admiral has more yellow than any of the others, and the bands of the extra-admiral run into one another.

ADMIRALTY, the office of lord high-admiral, whether diſcharged by one ſingle perſon, or by joint commiſſioners, called lords of the admiralty.

Court of ADMIRALTY is a ſovereign court, held by the lord high-admiral, or lords of the admiralty, where cognizance is taken of all maritime affairs, whether civil or criminal; where they are tried by judge and jury: but in civil caſes the manner is different, the deciſions being all made according to the civil law.

ADMIRATION, in grammar, is a mark or character made uſe of to ſignify ſomething that is wonderful, or worthy of admiration: it is expreſſed thus (!), and may be placed either at the end of the word that is exclamatory, or deferred to the end of a ſentence. It ſeems however as if this diſtinction ſhould be made, that when the exclamation is not detached from the other part of the ſentence, it ſhould be poſtponed to the end, as in the following lines:

See how the force of others prayers I try,
(Oh pious fraud of amorous charity!)

Where the exclamation is detached, it will be better, if placed immediately after it, as thus,

Jeſus!—and didſt thou leave thy bleſt abode, &c.

But nothing is ſo vague and arbitrary as punctuation. See PUNCTUATION.

ADMISSION, *admiſſio*, among eccleſiaſtical writers, denotes the act of a biſhop's admitting or allowing a clerk to be able, or qualified for ſerving a cure.

This is done after examination, by pronouncing the formula *admitto te habilem*. If any perſon preſume to be admitted, who has not epiſcopal ordination, he ſhall forfeit 100l.

ADMITTENDO *clerico*, a writ granted to a perſon, who has recovered his right of preſentation in the common pleas; by which the biſhop, or metropolitan, is ordained to admit his clerk. See ADMISSION.

ADMITTENDO *in ſocium*, a writ aſſociating certain perſons, uſually knights, and other gentlemen of the county, to the juſtices of aſſize already appointed.

ADMONITION, in church hiſtory, a part of diſcipline which conſiſts chiefly in warning an offender of the irregularities he is guilty of, and adviſing him to mend his manners.

By the ancient canons, nine admonitions were required before excommunication. See EXCOMMUNICATION.

ADMO-

ADMONITIO *fuſtium*, among the Romans, a military puniſhment, not unlike our whipping, only that it was performed with vine branches.

ADMORTIZATION, in the feudal cuſtoms, the reducing the property of lands or tenements to mortmain. See MORTMAIN.

ADNATA, in anatomy, one of the tunics or coats of the eye; otherwiſe called conjunctiva and albuginea.

It is the ſame part with what is called the white of the eye, formed by the tendinous expanſions of the muſcles which move the eye. See EYE.

ADNATA, in botany, implies the increaſe which grows on the ſides of bulbous roots, as lillies, tulips, narciſſus's, pancratiums, &c. theſe off-ſets will ſhew their bloſſoms in a much ſhorter time, than by propagation from ſeed.

ADNATA is alſo a term uſed for ſuch things as grow upon animal or vegetable bodies, whether inſeparable, as hair, wool, horns, &c. or accidental, as the few epiſitical plants.

ADNOUN, in grammar, the ſame with adjective. See ADJECTIVE.

ADOLESCENCE, the flower of youth in the human ſpecies, commencing at infancy and terminating in manhood. This period of human life is commonly computed from fifteen to twenty-five years of age.

ADONAI, one of the names of God uſed in ſcripture. It properly ſignifies *my lords*.

ADONAI, in antiquity, were feſtivals kept in honour of Venus, and in memory of her beloved Adonis.

The Adonai laſted two days; on the firſt of which the images of Venus and Adonis were carried with great ſolemnity, in the manner of a funeral; the women following the ſtatues, crying, tearing their hair, and beating their breaſts. On the ſecond they changed the mournings into joy, and ſung his praiſes, as if Adonis had been again reſtored to life.

The Adonia were celebrated by the ancient Greeks, Egyptians, Syrians, Lycians, &c.

ADONIAS, a name given by the ancient botaniſts to the anemony, or wind flower, from a ſuppoſition that it owed its origin to the tears ſhed by Venus in lamenting the death of her beloved Adonis.

ADONIC, in ancient poetry, a kind of verſe conſiſting of a dactyle and ſpondee.

This kind of verſe has its name on account of its being originally uſed in the lamentations for Adonis. Its principal uſe however among the poets, is to ſerve as a concluſion to each ſtrophe of Saphic verſe.

ADONIS *flos*, in botany, a genus of plants whoſe leaves bear the reſemblance of fennel. The flower is polyandrious and roſaceous, with many germina collected in one head: the common ſort in gardens is called pheaſant's eye, from its ſimilitude to the eye of a pheaſant.

ADOPTIANI, in eccleſiaſtical hiſtory, a ſect of heretics, who maintained that Chriſt, with reſpect to his human nature, was not the natural but the adoptive ſon of God.

ADOPTION, a ſolemn act, whereby one man makes another his heir; inveſting him with all the rights and privileges of a ſon.

ADOPTIVE, in a general ſenſe, implies ſomething adopted.

ADOPTIVE *Arms*, in heraldry, are thoſe enjoyed by the conceſſion of another, which the adopter is obliged to marſhal with his own, as being the condition of ſome honour or eſtate left him.

ADORATION, the act of worſhipping the divine Being.

This ceremony was differently performed by different people. Among the Jews it conſiſted in kiſſing the hands, bowing, kneeling, and even proſtration. Among the Romans it was performed with the head veiled, or covered, the devotee applying his right hand to his lips, the fore-finger reſting upon the thumb, which was erect; and then bowing, he turned himſelf round from left to right. The Gauls, on the contrary, thought it more religious to turn from right to left: and the Greeks to worſhip with their heads uncovered. The Chriſtians follow the Grecian rather than the Roman mode, by uncovering their heads when they perform any kind of adoration.

Divines ſpeak of many kinds of adoration; as ſupreme adoration, or that which is paid immediately to God; ſubordinate adoration, or that rendered to inferior beings; abſolute adoration, or that paid to a being on account of its own perfections: this is oppoſed to relative adoration, or that paid to an object as belonging to, or repreſenting another.

ADORATION is alſo uſed in a civil ſenſe, for any extraordinary homage, or reſpect paid by one man to another.

The Perſians adored their kings by falling proſtrate before them, ſtriking the earth with their foreheads, and kiſſing the ground. This was a piece of ſervility which Conon, a nobleman of Athens, refuſed to comply with when introduced to Artaxerxes; neither would the philoſopher Caliſthenes perform it to Alexander the Great, as judging it at once impious and unlawful.

The Roman emperors were adored, by bowing or kneeling at their feet, laying hold of their purple robe, and immediately withdrawing the hand and kiſſing it.

ADORATION is more commonly uſed to ſignify the ceremony of paying homage to the pope, by kiſſing his feet; which not only the people, but the greateſt prelates, and even princes themſelves, of the Romiſh religion, make no ſcruple of performing.

ADORATION is ſtill more particularly uſed for one of the methods uſed in electing a new pope; when the cardinals, inſtead of proceeding in the uſual way, unanimouſly fall down and adore one of their own number. Adoration is the laſt ceremony of a regular election, but here it is the election itſelf, or rather ſuperſedes it.

Perpetual ADORATION, in the church of Rome, a kind of religious ſociety, frequent in the popiſh countries; it conſiſts of a number of devout perſons, who by dividing themſelves into three bodies, and regularly relieving one another at ſtated hours, keep conſtantly praying before the euchariſt day and night.

ADOSSEE, in heraldry, a term uſed for two rampant lions placed back to back.

It is alſo uſed to ſignify any other figures, as axes, keys, &c. placed with their heads facing different ways.

ADOXA, in botany, the tuberoſe moſchatel, a low plant of a perfume ſmell, growing in ſeveral woods in England: its leaves are like thoſe of the bulbous fumitory, and the flowers monopetalous. It is called in ſome places muſk crowfoot.

AD QUOD DAMNUM, in law, a writ which ought to be iſſued before the king grants certain liberties, as a fair, market, or the like; ordering the ſheriff to enquire what damage the country is likely to ſuffer by a grant of that kind. The ſame writ is alſo iſſued, for making a ſimilar enquiry with reſpect to lands granted to religious houſes, or corporations; for turning and changing of highways, &c.

ADSTRICTION, among phyſicians, implies too great a rigidity and cloſeneſs in the emunctories of the body, particularly the pores of the ſkin. They alſo ſometimes uſe it to ſignify the ſtyptic or aſtringent quality of medicines.

AD TERMINUM *qui præteriit*, in law, a writ of entry that lies for the leſſor or his heirs, if after the expiration of a term for life or years, granted by leaſe, the tenant or other occupier of the lands, &c. withholds the ſame from ſuch leſſor.

ADVANCE, in the mercantile ſtile, denotes money paid before goods are delivered, work done, or buſineſs performed.

ADVANCE-*Poſt*, in fortification, a ditch thrown round the eſplanade or glacis of a place, to prevent its being ſurprized by the beſiegers.

The ditch ſometimes made in that part of the lines or retrenchments neareſt the enemy, to prevent him from attacking them, is alſo called the advance-foſſe. See RETRENCHMENT, and LINE *of Circumvallation*.

The advance-foſſe ſhould always be full of water, otherwiſe it will ſerve the enemy for a covering from the fire of the place, if he becomes maſter of the foſſe; beyond the advance-foſſe it is uſual to conſtruct lunettes, redoubts, &c. See LUNETTE, and REDOUBT.

ADVANCED-*guard*, or *Van-guard*, in the art of war, denotes the firſt line or diviſion of any army, ranged, or marching in order of battle; or it is that part which is next the enemy, and marches firſt towards them. See ARMY.

ADVANCED-*guard* is more particularly uſed for a ſmall party of horſe ſtationed before the main-guard. See GUARD.

ADUAR, in the Arabian and Mooriſh cuſtoms, a kind of ambulatory village, conſiſting of tents; which theſe people remove from one place to another, as ſuits their conveniency.

ADVENT, in the calendar, denotes the time immediately preceding Chriſtmas. It includes four Sundays, or weeks, which begin either on St. Andrew's day, or on the Sunday before or after it.

The term advent, *adventus*, properly ſignifies the approach or coming on of the feaſt of the nativity. See the article NATIVITY.

During advent, and the end of the octaves of epiphany, the ſolemnizing of marriage is forbid, without a ſpecial licence. See MARRIAGE.

ADVENTITIOUS, an appellation given to whatever accrues to a perſon or thing from without. Such are ſparry incruſtations upon wood, &c.

ADVENTITIOUS, among civilians, denotes all ſuch goods as are acquired accidentally, or by the liberality of a ſtranger, &c.

ADVENTITIOUS *Foſſils*, the ſame with extraneous or foreign ones, found imbodied in other foſſils: ſuch as ſhells, bones, &c. in ſtone.

Bill of ADVENTURE, among merchants, a writing ſigned by a merchant, teſtifying that the goods mentioned in it to be ſhipped on board a certain veſſel belong to another perſon, who is to run all hazards; the merchant only obliging himſelf to account to him for the produce of them, be that what it will.

ADVERB, *adverbium*, a term in grammar, made uſe of to modify the action which the verb ſignifies, and for that reaſon it is placed near the verb, according to its derivation, which is *ad* and *verbum*; not but that it is ſometimes joined to adjectives, participles, nay and even ſubſtantives themſelves, as, He is *truly* king.

Adverbs, though very numerous, may be reduced to the following claſſes: adverbs of time, as *when*; of place, as *where*; of quantity, as *how much*; of quality, as *wiſely*; of manner, as *ſwiftly*; of interrogation, as *why*; of affirmation, as *yes*; of negation, as *no*; of diminution, as *almoſt*; of doubt, as *perhaps*; of exception, as *only*; with ſome adjectives, which in Latin, French, &c. are uſed adverbially, as, *tranſverſa tuentibus hircis*, for *tranſverſè*; and, *il chante juſte*, for *juſtement*.

ADVERSARIA, among the ancients, was a book of accounts, reſembling in ſome meaſure our day-book, or journal. But the term is at preſent uſed by men of letters, to ſignify a common-place book, wherein they enter every thing that occurs to them worthy of notice.

ADVICE, or *Letter of Advice*, a letter miſſive, by which a merchant, or banker, informs his correſpondent, that he has drawn a bill of exchange upon him, ſent him a quantity of merchandize, or that his debtor's affairs are in a bad ſtate.

If the letter of advice reſpects a bill of exchange, the name of the perſon in whoſe favour it was drawn, the date, value of the bill, and time of payment ſhould be mentioned; for without ſuch a letter of advice, it is very allowable for the perſon on whom the bill is drawn, to refuſe both acceptance and payment.

ADULTERATION, in a general ſenſe, implies the act of debaſing by an improper mixture ſomething that was before pure and genuine. Thus the adulteration of coin implies, the uſing a greater proportion of alloy than is appointed by the ſtandard: and the adulteration of a medicine ſignifies the uſing ingredients of leſs virtue and efficacy in the compoſition, than thoſe ordered in the recipe.

ADULTERY, the crime of married perſons, whether huſband or wife, who, in violation of their marriage vow, have carnal commerce with another beſides the perſon to whom their faith has been plighted.

ADULTERY, in the ſcripture language, is alſo uſed to ſignify idolatry, or the forſaking the worſhip of the true God for that of an idol.

ADVOCATE, among the ancient Romans, implied a perſon who undertook the defence of cauſes, which he pleaded much in the ſame manner as our barriſters do at preſent.

The term is ſtill uſed in countries where the civil law obtains. In Scotland there is a college of advocates, conſiſting of one hundred and eighty members, appointed to plead in all actions before the lords of ſeſſions. In France there are two kinds of advocates, one of which plead in all cauſes, and the other give their opinions.

Lord ADVOCATE, one of the officers of ſtate in Scotland, who pleads in all caſes of the crown, or where the king is concerned.

ADVOCATE, among eccleſiaſtical writers, implies a perſon who undertakes the defence of a church, monaſtery, &c.

ADVOCATION, among civilians, ſignifies the act of calling another to aſſiſt us in pleading ſome cauſe.

Letters of ADVOCATION, in the law of Scotland, implies a writ iſſued by the lords of ſeſſion, advocating, or calling, a cauſe from an inferior judge to themſelves.

ADVOWEE, in law, ſignifies the patron of a church, or the perſon who has a right to preſent to a benefice.

ADVOWSON, in law, implies the right of patronage, or preſenting to a vacant benefice.

ADUSTION, among phyſicians, implies an inflammation of the parts about the brain and its membranes, attended with a hollowneſs of the ſinciput and eyes, a pale colour, and dryneſs of the body.

ADYTUM, ἄδυτον, in pagan antiquity, the moſt retired and ſacred place of their temples, into which none but the prieſts were allowed to enter.

The term is purely Greek, ſignifying inacceſſible.

The adytum of the heathens anſwered to the *ſanctum ſanctorum* of the Jews, and was the place from whence they delivered oracles.

ADZE, a kind of ax, otherwiſe called addice. See the article ADDICE.

AE, or Æ, among grammarians, a diphthong, or double vowel, compounded of A and E.

The orthography of this diphthong is far from being fixed, the ſimple E frequently ſupplying its place. When, therefore, an article cannot be found under Æ, the reader is to look for it under E: though the references, for the moſt part, will be a faithful guide in caſes of this nature.

ÆACEA, in Grecian antiquity, ſolemn feſtivals and games celebrated at Ægina, in honour of Æacus; who, on account of his juſtice upon earth, was thought to have been appointed one of the judges in hell.

ÆDILE, *ædilis*, in Roman antiquity, a magiſtrate whoſe chief buſineſs was to ſuperintend buildings of all kinds, but more eſpecially public ones, as temples, aqueducts, bridges, &c.

To the ædiles likewiſe belonged the care of the highways, public places, weights, and meaſures, &c. They alſo fixed the prices of proviſions, took cognizance of debauches, puniſhed lewd women, and ſuch perſons as frequented gaming houſes. The cuſtody of the plebiſcita, or orders of the people, were likewiſe committed to them. They had the inſpection of comedies, and other pieces of wit; and were obliged to exhibit magnificent games to the people, at their own expence, whereby many of them were ruined.

At firſt the ædiles were only two in number, and choſen from among the common people; but theſe being unable to ſupport the expence of the public ſhews, two more were created out of the patrician order; theſe laſt took upon themſelves all the charges of the games, and were called *ædiles curules*, or *majores*, as the two plebeians were denominated *minores*.

Julius Cæſar, in order to eaſe theſe four, created

two

two others, who were called *ædiles cereales*, as having the inſpection of all manner of grain committed to their care.

There were alſo ædiles in the municipal cities, who had much the ſame authority as thoſe in Rome.

ÆDILITIAN *edict*, *ædilitium edictum*, among the Romans, was particularly uſed for the ædile's ſentence, allowing redreſs to the purchaſer of a beaſt, or ſlave, that had been impoſed on.

ÆGAGROPILA, or ÆGAGROPHILUS, αιγαγροπιλος, in natural hiſtory, a ball compoſed of a ſubſtance reſembling hair, generated in the ſtomach of the chamois-goat.

It is a kind of bezoar, called *bezoar germanicum*, and is poſſeſſed of no medicinal virtue, no more than the balls of the ſame kind formed in the ſtomachs of cows, hogs, &c. See BEZOAR.

ÆGILOPS, Αιγιλωψ, among phyſicians, an abſceſs in the corner of the eye, next the noſe; or, according to Heiſter, a ſmall tumour cauſed by an inflammation or abſceſs, which in time, by the acrimony of its purulent matter, erodes the external ſkin, lacrymal ducts, and fat round the ball of the eye; nay, ſometimes it renders the neighbouring bones carious to a dangerous degree.

As to the method of treatment, the ſurgeon is firſt to endeavour to diſperſe the tumour, by moiſtening it ſeveral times a day with ſpirit of vitriol; but if he finds this impracticable, he is to forward the ſuppuration as much as poſſible, leſt an obſtinate fiſtula, or worſe conſequences, ſhould be the effects of too long delay. For this purpoſe, a plaiſter of diachylon with the gums, or emollient cataplaſms may be uſed.

When fully ripe, the tumour is to be laid open with a lancet or ſcalpel, and the ulcer cleanſed and healed in the ordinary way. See ULCER.

ÆGIPAN, in heathen mythology, a denomination given to the god Pan, by reaſon he was repreſented with the horns, legs, feet, &c. of a goat.

ÆGIS, in heathen mythology, is particularly uſed for the ſhield or cuiraſs of Jupiter and Pallas.

Ægis is derived from αιξ, αιγος, a ſhe-goat; Jupiter having covered his ſhield with the ſkin of Amalthea, the goat that ſuckled him. Afterwards making a preſent of the buckler to Minerva, this goddeſs fixed the head of Meduſa on the middle of it, which, by that means, became capable of turning all thoſe into ſtone who looked at it.

ÆGIUCHUS, in heathen mythology, a ſurname of Jupiter, given him on account of his having been ſuckled by a goat.

ÆGYPTIACUM, in pharmacy, the name of ſeveral detergent ointments, uſed for eating off rotten fleſh, and cleanſing foul ulcers.

ÆNIGMA, αινιγμα, denotes any dark ſaying or queſtion, wherein ſome well known thing is concealed under obſcure language.

The parable, gryphus, and rebus, are by ſome accounted three ſpecies, or branches of ænigma. See PARABLE, GRYPHUS, and REBUS.

ÆOLIC *dialect*, among grammarians, one of the five dialects of the Greek tongue, agreeing in moſt things with the Doric dialect. See DORIC.

ÆOLIC *digamma*. See DIGAMMA.

ÆOLIC *verſe*, in proſody, a kind of verſe, conſiſting of an iambus, or ſpondee, then of two anapeſts, ſeparated by a long ſyllable, and laſtly, of another ſyllable. Such is,

O ſtelliferi conditor orbis.

ÆOLIPILE, in hydraulics, an inſtrument conſiſting of a hollow metalline ball, with a ſmall pipe or neck ſcrewed thereto, which being filled with water, and expoſed to the fire, produces a ſtrong blaſt of wind.

This inſtrument the mechanical and experimental philoſophers chiefly make uſe of, to account for the natural cauſe and generation of winds, and ſome have uſed this machine to meaſure the gravity and rarefaction of the air, but without ſucceſs, as there are many objections and difficulties which it is liable to. Others have ſuppoſed that if the æolipile was fixed to ſome ſonorous inſtrument, as a trumpet or a horn, it might produce muſic, or with proper additions be made to repreſent the fluctuating and playing up and down of the ſtream of a fountain; likewiſe being placed before the fire, to ſerve as a pair of bellows, when an intenſe heat is required; but theſe ſuppoſitions are only theory, and not capable of being reduced to practice, for experience ſhews us that inſtead of the blaſt kindling the fire it totally extinguiſhes, or puts it out. However, the æolopile being properly conſtructed, it may with ſome ſucceſs, we think, be applied to cure ſmoaking chimnies, and without great expence; for being filled with water, and hung properly in the funnel of the chimney, the blaſt which will quickly enſue from the heat of the fire, will drive up the loitering ſmoke, and cauſe a ſtrong draught. See WIND, HEAT, WATER, AIR, and RAREFACTION.

ÆOLUS, in the heathen theology, the god of the winds, painted with ſwoln blubber cheeks, like one who with main force endeavours to blow a blaſt; alſo with two ſmall wings upon his ſhoulders, and a fiery high-coloured countenance.

ÆQUATION,	See	EQUATION.
ÆQUATOR,		EQUATOR.
ÆQUILIBRATOR,		EQUILIBRATOR.
ÆQUILIBRIUM,		EQUILIBRIUM.
ÆQUINOCTIAL,		EQUINOCTIAL.
ÆQUIPOLLENT,		EQUIPOLLENT.
ÆQUIVALENT,		EQUIVALENT.
ÆQUIVOCAL,		EQUIVOCAL.
ÆQUIVOCATION,		EQUIVOCATION.

ÆRA, in chronology, a ſeries of years, commencing from a certain fixed point of time, called epocha: thus, we ſay the Chriſtian æra, that is, the number of years elapſed ſince the birth of Chriſt.

The generality of authors, however, uſe the terms æra and epocha in a ſynonymous ſenſe, or for the point of time from which the computation commences, making no other difference between them, except that the former is chiefly uſed by the vulgar, and the latter by chronologers. See EPOCHA.

AERIAL, in a general ſenſe, denotes ſomething partaking of the nature of air: thus we ſay, an aerial ſubſtance, aerial particles, &c.

AERIAL *Perſpective*, is that which repreſents bodies diminiſhed and weakened in proportion to their diſtance from the eye, and has chiefly to do with the colours of objects, whoſe luſtre and force is diminiſhed in proportion to the diſtance of the object you are to repreſent; for the longer the column of air that any body is ſeen through, ſo much the fainter do the rays emitted from it, appear to the eye. See PERSPECTIVE.

AERIANS, *Aeriani*, in church hiſtory, the name of certain ſectaries of the fourth century, who were ſo called from Aerius, a prieſt of Armenia, who was their chief. Theſe Arians had pretty much the ſame notions, with reſpect to the Trinity, that the Arians had; but they entertained beſides ſome tenets that were peculiar to themſelves. Aerius was diſſatisfied that Euſtathius, his former companion, ſhould ſucceed to a biſhopric, for which he had been candidate himſelf; and therefore defamed the order of biſhops, as an encroachment upon the prieſthood. He looked upon all the faſts of the church to be merely ſuperſtitious, and affirmed that even the paſſover itſelf ſhould not be obſerved; he admitted none into his ſect, but thoſe who lived in continence, and condemned marriage as unlawful.

AEROGRAPHY ſignifies a deſcription of the air, eſpecially of its dimenſions, and other moſt obvious properties; in which ſenſe, it differs but little from

AEROLOGY, which is a ſcientifical account of the nature and leſs obvious properties of air. See AIR and ATMOSPHERE.

AEROMANCY, *Aeromantia*, a ſpecies of divination performed by means of air, winds, &c.

AEROMANCY is alſo uſed for the art of foretelling the various changes of the air and weather, by means of barometers, hygrometers, &c. See BAROMETER, &c.

AEROMETRY, the ſcience of meaſuring the air, its powers and properties; the term, at preſent, is not much in uſe, for this part of natural philoſophy is commonly called pneumatics. See PNEUMATICS.

ÆSCHYNOMENE, in botany, a genus of plants, that bears a papilionaceous flower, and its leaves contract by the touch; whence it has been called the baſtard ſenſitive plant. Botaniſts enumerate five ſorts, which are all natives of the warmer climates.

ÆSCULAPIUS's *Serpent*, *Æſculapii anguis*, in zoology, a harmleſs kind of ſerpent, otherwiſe called paræa. See PARÆA.

ÆSCULUS, in botany. See HORSE-CHESNUT.

ÆTHER, Αἰθηρ, in phyſiology, an exceeding fine, thin, ſubtile fluid, concerning which philoſophers are greatly divided; however, the ſentiments of Sir Iſaac Newton, which are moſt received, are as follows:

1. He ſuppoſes that an ætherial ſubſtance is diffuſed through all places, and that it is capable of contraction and dilatation, ſtrongly elaſtic, and much like air in all reſpects, but much more ſubtile.

2. He ſuppoſes that this æther pervades all groſs bodies, but yet ſo as to ſtand rarer in their pores, than in free ſpaces, and ſo much the rarer as their pores are leſs: that it is the cauſe why light incident on thoſe bodies, is refracted towards the perpendicular. See LIGHT and REFRACTION. Why two well poliſhed metals cohere in a receiver exhauſted of air. See COHESION. Why mercury ſtands ſometimes up to the top of a glaſs pipe, though much higher than 30 inches, and one of the chief cauſes why the parts of all bodies cohere; alſo the cauſe of filtration, of the riſing of water in ſmall glaſs pipes, above the ſurface of the ſtagnated water they are dipped in, for he ſuſpects the æther may ſtand rarer, not only in the inſenſible pores of bodies, but even in the very ſenſible cavities of theſe pipes. See CAPILLARY TUBE. And the ſame principle may cauſe menſtruums to pervade with violence the pores of bodies they diſſolve, the ſurrounding æther as well as the atmoſphere preſſing them together.

3. He ſuppoſes the rarer æther within bodies, and the denſer without them, not to be terminated in a mathematical ſuperficies, but to grow gradually into one another, the external æther beginning to grow rarer, and the internal to grow denſer, at ſome little diſtance from the ſuperficies of the body, and running through all degrees of denſity in the intermediate ſpaces; and that this may be the cauſe why light, in Grimaldi's experiment, paſſing by the edge of a knife, or other opake body, is turned aſide, and as it were refracted, and by that refraction makes ſeveral colours.

Let ABCD, (Plate VI. *fig.* 1.) be a denſe body whether opake or tranſparent; EFGH, the outſide of the uniform æther which is within it; IKLM, the inſide of the uniform æther which is without it, and conceive the æther which is between EFGH and IKLM to run through all

intermediate degrees of denſity, between that of the two uniform æthers on either ſide. This being ſuppoſed, the rays of the ſun SB, SK, which paſs by the edge of this body between B and K, ought in their paſſage through the unequally denſe æther there, to receive a ply from the denſer æther, which is on that ſide towards K; and that the more, by how much they paſs nearer to the body, and thereby be ſcattered through the ſpace PQRST, as by experience they are found to be. Now the ſpace between the limits EFGH and IKLM, he calls the ſpace of the æther's graduated rarity.

4. When two bodies moving towards one another come near together, he ſuppoſes the æther between them to grow rarer than before, and the ſpaces of its graduated rarity to extend further from the ſuperficies of the bodies towards one another, and this by reaſon that the æther cannot move and play up and down ſo freely in the ſtraight paſſage between the bodies as it could before they came ſo near together. Thus, if the ſpace of the æther's graduated rarity reach from the body ABCDEF (*fig.* 2.) only to the diſtance GHLMRS, when no other body is near it, yet may it reach farther, as to IK, when another body NOPQ approaches; and as the other body approaches more and more, he ſuppoſes the æther between them will grow rarer and rarer.—Note, He has ſo deſcribed thoſe ſuppoſitions, as if he thought the ſpaces of graduated æther had preciſe limits, as is expreſſed at IKLM in the firſt figure, and at GMRS in the ſecond, for thus he thought he could better expreſs himſelf: but he did not think they have ſuch preciſe limits, but rather decay inſenſibly, and in ſo decaying, extend to a much greater diſtance than can eaſily be believed, or need be ſuppoſed.

5, Now, from the fourth ſuppoſition it follows, that if two bodies approaching one another, come ſo near together as to make the æther between them begin to rarify, they will have a reluctance from being brought nearer together, and an endeavour to recede from one another; which reluctance and endeavour will increaſe as they come nearer together, becauſe thereby they cauſe the interjacent æther to rarefy more and more; but at length, when they come ſo near together, that the exceſs of preſſure of the external æther which ſurround the bodies, above that of the rarefied æther which is between them, is ſo great, as to overcome the reluctance which the bodies have from being brought together, then will that exceſs of preſſure drive them with violence together, and make them adhere ſtrongly to one another, as was ſaid in the ſecond ſuppoſition.

For inſtance, (Plate IV. *fig.* 2.) when the bodies ED and NP are ſo near together, that the ſpaces of the æther's graduated rarity begin to reach one another, and meet in the line IK, the æther between them will have ſuffered much rarefaction, which rarefaction requires much force; that is, much preſſing of the bodies together; and the endeavours which the æther between them has to return to its former ſtate of condenſation, will cauſe the bodies to have an endeavour to recede from one another. But on the other hand, to counterpoiſe this endeavour, there will not yet be any exceſs of denſity of the æther which ſurrounds the bodies, above that of the æther which is between them at the line IK. But if the bodies come nearer together, ſo as to make the æther in the midway line IK, grow rarer than the ſurrounding æther, there will ariſe from the exceſs of denſity of the ſurrounding æther, a compreſſure of the bodies toward one another, which when by the near approach of the bodies, it becomes ſo great as to overcome the aforeſaid endeavour the bodies have to recede from one another, they will then go towards one another, and adhere together; and on the contrary, if any power force them aſunder to that diſtance, where the endeavour to recede begins to overcome the endeavour to accede, they will again leap from one another. Hence, he conceives, it is chiefly that a fly walks on water without wetting her feet, and conſequently, without touching the water; that two poliſhed pieces of glaſs are not without preſſure brought to contact, no, not though one be plane, the other a little convex; that the particles of duſt cannot be made to cohere, as they would do if they did but fully touch; that the particles of tinging ſubſtances and ſalts diſſolved in water, do not of their own accord concrete and fall to the bottom, but diffuſe themſelves all over the liquor, and expand ſtill more if you add more liquor to them. Alſo, that the particles of vapours, exhalations, and air, do ſtand at a diſtance from one another, and endeavour to recede as far from one another as the preſſure of the incumbent atmoſphere will let them: for he conceives the confuſed maſs of vapours, air, and exhalations, which we call the atmoſphere, to be nothing elſe but the particles of all ſorts of bodies of which the earth conſiſts ſeparated from one another, and kept at a diſtance by the ſame principle.

He likewiſe ſuppoſes æther to conſiſt of parts differing from one another in ſubtilty by indefinite degrees; that in the pores of bodies there is leſs of the groſſer æther in proportion to the finer than in open ſpaces, and conſequently, that in the great body of the earth, there is much leſs of the groſſer æther in proportion to the finer than in the regions of the air; and that yet the groſſer æther in the air affects the upper regions of the earth, and the finer æther in the earth the lower regions of the air, in ſuch a manner, that from the top of the air to the ſurface of the earth,

and again from the ſurface of the earth to the center thereof, the æther is inſenſibly finer and finer. Imagine now any body ſuſpended in the air, or lying on the earth, and the æther being by the hypotheſis, groſſer in the pores which are in the upper parts of the body, than thoſe which are in the lower parts of the body, and that the groſſer æther being leſs apt to be lodged in thoſe pores, than the finer æther below, it will endeavour to get out and give way to the finer æther below, which cannot be without the bodies deſcending to make room above for it to go out into. See GRAVITY.

The above doctrine of the æther is part of what was drawn up by Sir Iſaac Newton for the uſe of Mr. Boyle; his further thoughts on the ſame ſubject will be found in the following Queries, which he inſerted many years after among others, in his excellent book of Optics.

Qu. 16. When a man in the dark preſſes either corner of his eye with his finger, he will ſee a circle of colours like thoſe in a peacock's tail. If the eye and the finger remain quiet, theſe colours vaniſh in a ſecond minute of time; but if the finger be moved with a quivering motion they appear again. Do not theſe colours ariſe from ſuch motions excited in the bottom of the eye, by the preſſure and motion of the finger, as at other times are excited there by light cauſing viſion? And do not the motions once excited continue about a ſecond of time before they ceaſe? And when a man by a ſtroke upon his eye ſees a flaſh of light, are not the like motions excited in the retina by the ſtroke? And when a coal of fire moving nimbly in the circumference of a circle, makes the whole circumference appear like a circle of fire, is it not becauſe the motions excited in the bottom of the eye by the rays of light, are of a laſting nature, and continue till the coal of fire in going round returns to its former place? And conſidering the laſtingneſs of the motions excited in the bottom of the eye by light, are they not of a vibrating nature?

Qu. 17. If a ſtone be thrown into ſtagnating water, the waves excited thereby continue ſome time to ariſe in the place where the ſtone fell into the water, and are propagated from thence in concentric circles upon the ſurface of the water to great diſtances. And the vibrations or tremors excited in the air by percuſſion, continue a little time to move from the place of percuſſion in concentric ſpheres to great diſtances. And in like manner, when a ray of light falls upon the ſurface of any pellucid body, and is there refracted or reflected; may not waves of vibrations or tremors be thereby excited on the refracting or reflecting medium at the point of incidence, and continue to ariſe there, and to be propagated from thence as long as they continue to ariſe, and be propagated when they are excited in the bottom of the eye by the preſſure or motion of the finger, or from the light which comes from the coal of fire in the experiments above mentioned? And theſe vibrations propagated from the point of incidence to great diſtances? And do they not overtake the rays of light, and by overtaking them ſucceſſively, do they not put them into fits of eaſy reflection and eaſy tranſmiſſion deſcribed above? For if the rays endeavour to recede from the denſeſt part of the vibration, they may be alternately accelerated and retarded by the vibrations overtaking them.

Qu. 18. If in two large tall cylindrical veſſels of glaſs inverted, two little thermometers be ſuſpended ſo as not to touch the veſſels, and the air be drawn out of one of theſe veſſels, and theſe veſſels thus prepared be carried out of a cold place into a warm one; the thermometer *in vacuo* will grow warm as much, and almoſt as ſoon, as the thermometer which is not *in vacuo*. And when the veſſels are carried back into the cold place, the thermometer *in vacuo* will grow cold almoſt as ſoon as the other thermometer. Is not the heat of the warm room, conveyed through the vacuum by the vibrations, of a much ſubtiler medium than air, which after the air was drawn out remained in the vacuum? And is not this medium the ſame with that medium by which light is refracted and reflected, and by whoſe vibrations light communicates heat to bodies, and is put into fits of eaſy reflexion and eaſy tranſmiſſion? And do not the vibrations of this medium in hot bodies, contribute to the intenſeneſs and duration of the heat? And do not hot bodies communicate their heat to contiguous cold ones, by the vibrations of this medium propagated from them into the cold ones? And is not this medium exceedingly more rare and ſubtile than the air, and exceedingly more elaſtic and active? And doth it not readily pervade all bodies? And is it not, by its elaſtic force, expanded through all the heavens? See HEAT.

Qu. 19. Doth not the refraction of light proceed from the different denſity of this æthereal medium in different places, the light receding always from the denſer parts of the medium? And is not the denſity of it greater in free and open ſpaces void of air and other groſſer bodies, than within the pores of water, glaſs, cryſtal, gems, and other compact bodies? For when light paſſes through glaſs or cryſtal, and falling very obliquely upon the farther ſurface thereof is totally reflected, the total reflection ought to proceed rather from the denſity and vigour of the medium without and beyond the glaſs, than from the rarity and weakneſs thereof.

Qu. 20. Doth not this ætherial medium in paſſing out of water, glaſs, cryſtal, and other compact and denſe bodies, into empty ſpaces, grow denſer and denſer by degrees, and by that means refract

refract the rays of light, not in a point, but by bending them gradually in curve lines? And doth not the gradual condenſation of this medium extend to ſome diſtance from the bodies, and thereby cauſe the inflections of the rays of light, which paſs by the edges of denſe bodies, at ſome diſtance from the bodies. See INFLECTION, REFLECTION, and REFRACTION.

Qu. 21. Is not this medium much rarer within the denſe bodies of the ſun, ſtars, planets and comets, than in the empty celeſtial ſpaces between them? And in paſſing from them to greater diſtances, doth it not grow denſer and denſer perpetually, and thereby cauſe the gravity of thoſe great bodies towards one another, and of their parts towards the bodies; every body endeavouring to go from the denſer parts of the medium towards the rarer? For if this medium be rarer within the ſun's body than at its ſurface, and rarer there than at the hundredth part of an inch from its body, and rarer there than at the fifteenth part of an inch from its body, and rarer there than at the orb of Saturn; he ſees no reaſon why the increaſe of denſity ſhould ſtop any where, and not rather be continued through all diſtances from the Sun to Saturn, and beyond. And though this increaſe of denſity may be exceeding ſlow, yet if the elaſtic force of this medium be exceeding great, it may ſuffice to impel bodies from the denſer parts of the medium towards the rarer, with all that power which we call gravity. And that the elaſtic force of this medium is exceeding great, may be gathered from the ſwiftneſs of its vibrations. Sounds move about 1140 Engliſh feet in a ſecond of time, and in ſeven or eight minutes of time they move above one hundred Engliſh miles. Light moves from the Sun to us in about ſeven or eight minutes of time, which diſtance is about 70000000 of Engliſh miles, ſuppoſing the horizontal parallax of the Sun to be twelve ſeconds. And the vibrations or pulſes of this medium, that they may cauſe the alternate fits of eaſy tranſmiſſion and eaſy reflexion, muſt be ſwifter than light, and by conſequence above 700000 times ſwifter than ſounds. And therefore the elaſtic force of this medium, in proportion to its denſity, muſt be above 700000 × 700000 (that is, above 490000000000) times greater than the elaſtic force of the air is in proportion to its denſity. For the velocities of the pulſes of elaſtic mediums, are in a ſubduplicate ratio of the elaſticities and the rarities of the mediums taken together.

As attraction is ſtronger in ſmall magnets than in great ones, in proportion to their bulk; and gravity is greater in the ſurfaces of ſmall planets than in thoſe of great ones, in proportion to their bulk; and ſmall bodies are agitated much more by electric attraction, than great ones: ſo the ſmallneſs of the rays of light may contribute very much to the power of the agent by which they are refracted. And ſo if any one ſhould ſuppoſe that æther, like our air, may contain particles which endeavour to recede from one another (for he owns he does not know what this æther is) and that its particles are exceedingly ſmaller than thoſe of air, or even than thoſe of light; the exceeding ſmallneſs of its particles may contribute to the greatneſs of the force by which thoſe particles may recede from one another, and thereby make that medium exceedingly more rare and elaſtic than air, and by conſequence exceedingly leſs able to reſiſt the motions of projectiles, and exceedingly leſs able to preſs upon groſs bodies, by endeavouring to expand itſelf.

Qu. 22. May not planets and comets, and all groſs bodies, perform their motions more freely, and with leſs reſiſtance, in this ætherial medium, than in any fluid which fills all ſpace adequately without leaving any pores, and by conſequence is much denſer than quickſilver or gold? And may not its reſiſtance be ſo ſmall, as to be inconſiderable? For inſtance, if this æther ſhould be ſuppoſed 700000 times more elaſtic than our air, and above 700000 times more rare; its reſiſtance would be above 600000000 times leſs than that of water. And ſo ſmall a reſiſtance would ſcarce make any ſenſible alteration in the motions of the planets in ten thouſand years. If any one would aſk, how a medium can be ſo rare? let him tell us how the air, in the upper parts of the atmoſphere, can be above a hundred thouſand times rarer than gold. Let him alſo tell us, how an electric body can, by friction, emit an exhalation ſo rare and ſubtile, and yet ſo potent, as by its emiſſion to cauſe no ſenſible diminution of the weight of the electric body, and to be expanded through a ſphere, whoſe diameter is above two feet; and yet to be able to agitate, and carry up leaf-copper, or leaf-gold, at the diſtance of above a foot from the electric body? And how the effluvia of a magnet can be ſo rare and ſubtile, as to paſs through a plate of glaſs without any reſiſtance or diminution of their force; and yet ſo potent, as to turn a magnetic needle beyond the glaſs?

Is not viſion performed chiefly by the vibrations of this medium, excited in the bottom of the eye by the rays of light, and propagated through the ſolid, pellucid, and uniform capillamenta of the optic nerves into the place of ſenſation? And is not hearing performed by the vibrations either of this or ſome other medium, excited in the auditory nerves by the tremors of the air, and propagated through the ſolid, pellucid, and uniform capillamenta of thoſe nerves into the place of ſenſation? And ſo of the other ſenſes.

Qu. 24. Is not animal motion performed by the vibrations of this medium, excited in the brain by the power of the will, and propagated from thence through

through the ſolid, pellucid, and uniform capillamenta of the nerves into the muſcles, for contracting and dilating them? Suppoſing that the capillaments of the nerves are each of them ſolid and uniform, that the vibrating motion of the æthereal medium may be propagated along them from one end to the other, uniformly and without interruption: for obſtructions in the nerves create palſies. And that they may be ſufficiently uniform, he ſuppoſes them to be pellucid, when viewed ſingly, though the reflections in their cylindrical ſurfaces, may make the whole nerve compoſed of many capillamenta appear opake and white: for opacity ariſes from reflecting ſurfaces, ſuch as may diſturb and interrupt the motion of this medium.

ÆTHER, in chemiſtry, an extremely penetrating ſpirit, made by diſtilling ſpirit of wine with oil of vitriol, and then precipitating the ſulphureous gas with an alcali.

Concentrated oil of vitriol being dropt by degrees into an equal quantity, or five or ſix times its quantity, of highly rectified ſpirit of wine, the liquor becomes firſt yellow and then reddiſh, and exhales an agreeable, diffuſive, penetrating ſmell, which if freely taken in with the breath affects the lungs: the taſte of the liquor is conſiderably acid.

On digeſting the mixture for ſome days, and then committing it to diſtillation in a retort with a very gentle warmth, there ariſes a ſubtile ſpirit, more fragrant and penetrating in ſmell than the undiſtilled liquor, very volatile, inflammable, in taſte not at all acid, but of the aromatic kind. This is the dulcified ſpirit of vitriol. It comes over in thin inviſible vapours, which condenſe upon the ſides of the recipient in ſtraight ſtriæ.

This ſpirit is ſucceeded by one of a different kind, which, being caught in a ſeparate receiver, is found to be ſenſibly acid, and of a pungent ſuffocating ſmell, like the fumes of burning brimſtone. Along with it comes over a ſmall quantity of oil; which ſometimes proves colourleſs, and ſwims on the ſulphureous liquor, and ſometimes appears yelloviſh or greeniſh, and ſinks to the bottom, according as the vinous ſpirit in the mixture was in large or in ſmall proportion.

The dulcified ſpirit alſo has frequently ſome ſlight acidity, ſufficient to alter the fine green tincture, which in its perfect ſtate it extracts from the leaves of plants. It is purified or rectified from this redundant acid, by mixing it with a weak ſolution of fixed alcaline ſalt, and diſtilling it over a ſecond time: for every pint of the ſpirit, may be taken a ſolution of a dram of alcali in a pint of water.

If the ſpirit, thus rectified, be mingled again with an equal quantity of a like alcaline ſolution, the mixture ſhaken together, appears milky: on ſtanding for a little time, there ariſes to the ſurface an extremely ſubtile fluid, called by the chemiſts æther, or ætherial ſpirit of wine. A conſiderable quantity of dulcified ſpirit may ſtill be ſeparated from the remaining liquor by diſtillation; and this ſpirit, mixed with freſh alcaline ſolution, affords more æther.

The æther is the lighteſt, moſt volatile, and moſt inflammable of all known liquors. It ſwims on the moſt highly rectified ſpirit of wine, being lighter than that ſpirit in the proportion nearly of 0,730 to 0,830. Dropt on the warm hand, it almoſt exhales, diffuſing a penetrating fragrance, and leaving no moiſture behind. On the approach of a candle it takes fire, and goes off in a flaſh like lightning. It does not mingle with water, with acid, or with alcaline liquors; but diſſolves ſome unctuous and reſinous bodies. Among metallic ſubſtances, it diſcovers a remarkable attraction to gold, but ſeems to have no effect on any of the others: mixed with a ſolution of gold made in acids, it imbibes the gold from the acid, carries it to the ſurface, and keeps it there diſſolved into a yellow liquor; hence its uſe for diſcovering gold in liquids.

The only perſon we know of who has given any plauſible theory of the production of this ſubtile fluid, is Mr. Macquer. Spirit of wine conſiſts chiefly of an oil, exquiſitely attenuated by fermentation, and intimately combined with water. According to Mr. Macquer, the æther is no other than this ſubtilized oil, extricated by the vitriolic acid; which acid, having a ſtrong affinity or attraction to water, abſorbs the watery element of the ſpirit, and thus ſets the oily one at liberty.

ÆTHERIAL, ſomething that participates of the nature of æther. See ÆTHER.

ÆTHERIAL *Oil*, among chemiſts, a ſubtile eſſential oil, approaching to the nature of ſpirits. See the article OIL.

ÆTHIOPS, or *Æthiops Mineral*, a preparation of mercury, made by rubbing in a marble or glaſs mortar, equal quantities of quick-ſilver and flowers of ſulphur, till the mercury wholly diſappears, and there remains a fine deep black powder, from whence it has got the name of Æthiops.

This is eſteemed one of the ſafeſt preparations of mercury, and is much uſed againſt cutaneous foulneſſes, in ſcrophulous caſes, in remains of venereal diſorders, and even in the gout and rheumatiſm. In ſcorbutic caſes ſcarce any medicine exceeds it; and it has been long known as a remedy againſt worms. Its doſe is from a ſcruple to a dram or two.

ÆTHIOPS *Albus*, a preparation of mercury, which is made by rubbing quick-ſilver with a double quantity of crabs-eyes, or of ſugar-candy, till it is extinguiſhed.

ÆTHIOPS *of Dr. Plummer*, a medicine prepared by levigating ſulphur auratum antimonii, with an

equal quantity of calomel: it is ſaid to be good in venereal and other cutaneous diſorders.

AETIANS, the followers of Aetius, known by the name of the Impious, a native of Syria, born in the fourth century: he was firſt a menial ſervant, then a goldſmith, afterwards a quack-doctor, and laſt of all a prieſt. He was a ſubtle ſophiſt, and a noiſy diſputant; and the doctrine of Arius making at that time a great buſtle in the Chriſtian world, he embraced it, and became one of his moſt zealous followers. He conſidered the moſt infamous actions as natural neceſſities, and not at all criminal; teaching his diſciples, that God required nothing of them but faith. Having been frequently driven out from place to place, he retired at laſt to Conſtantinople, where he died in the year 367. His followers after his death were called Eunomians, from Eunomus, a famous diſciple of Aetius.

ÆTIOLOGY, that branch of phyſic which aſſigns the cauſes of diſeaſes.

ÆTIOLOGY, in rhetoric, is deemed a figure of ſpeech, whereby, in relating an event, we at the ſame time unfold the cauſes of it.

ÆTITÆ, or ÆTITES, in natural hiſtory, a name given to pebbles or ſtones of any kind, which have a looſe nucleus rattling within them, and called in Engliſh the eagle-ſtone.

So far from being a particular genus of foſſils themſelves, we find ætitæ among very different genuſes, as the geodes, heteropyræ, &c. but the moſt valued of all others, is that formed of the ſeveral varieties of our common pebbles. See GEODES, &c.

As to the foundation of ætitæ, naturaliſts account for it from this conſideration, that as the nuclei are coarſer and more debaſed by earth than the reſt of the pebble, they muſt ſhrink up and contract themſelves into a ſmaller ſize; by which means, it will be ſeparated from the ſurrounding cruſt, and thereby become looſe.

Many imaginary virtues have been aſcribed to theſe ſtones, as, that they aſſiſt women in labour, diſcover thieves, &c. than which nothing can be more ridiculous.

AFFECTATION, in language and converſation, is a vice too frequent in the faſhionable world. It conſiſts in expreſſing the moſt common and trifling thing in terms far fetched, and often ridiculouſly choſen. Nothing is ſo inſupportable to a man of true wit, as one of theſe retailers of phraſes; who would rather bring forth a few little prettineſſes of expreſſion, than be able to conceive the moſt ſtrong, manly, and juſt ideas.

AFFECTATION, in writing, is nearly the ſame as in ſpeaking: it is the vice of a weak, effeminate, ſcribbling mind. It diſcovers itſelf in poor, little, ricketty thoughts, dreſſed up in language as variegated as a jack-pudding's coat, interſperſed with the prettieſt-fancied latiniſms, and phraſes half French and half Engliſh.

AFFECTATION in behaviour is a ſtrange and remarkable deportment of the body, occaſioned by a deſire to appear what a man is not, or to be taken notice of for ſomething that he is. In the firſt caſe it is diſagreeable, becauſe it is an impoſition or deceit, which is endeavoured to be put upon us; and it is equally ſo in the ſecond, becauſe it ariſes from vanity, or a too great attention to diſplay ſome ſuperiority. Affectation of all ſorts is a violation of ſimplicity and of nature: in converſation and writing it ariſes from hunting eagerly after wit; in dreſs and behaviour, from ſearching after graces. There are ſome perſons of ſo happy a mould, that they cannot acquire it; and others of ſo wretched a compoſition, that they cannot root it out of their texture.

AFFECTED *Equations*. See AFFECTED.

AFFECTION, in a general ſenſe, implies an attribute that cannot be ſeparated from its ſubject. Thus gravity is an affection of all bodies.

AFFECTION, in phyſics, the affections of a body are certain modifications produced by motion, in virtue of which, the body is diſpoſed after ſuch or ſuch a manner. The affections of bodies are ſometimes ſub-divided into primary and ſecondary.

Primary affections are thoſe which ariſe out of the idea of matter; as quantity and figure; or out of that of form, as that of quality and power; or out of both, as motion, place, and time.

Secondary, or derivative affections, are ſuch as ariſe out of primary ones, as diviſibility, continuity, contiguity, &c. which ariſe out of quantity; regularity, irregularity, &c. which ariſe out of figure.

AFFECTIONS *of the Mind*, are the ſame with paſſions, or inclinations. See the article PASSION.

AFFECTION, in medicine, a term uſed for any diſorder with which a limb or other part of the body is affected. Thus, we ſay, hypochondriacal, or hyſterical affection, &c. See the articles HYPOCHONDRIACAL, and HYSTERICS, &c.

AFFEERERS, or AFFEERORS, in law, perſons appointed in court-leets, courts-baron, &c. to ſettle, upon oath, the fines to be impoſed upon thoſe who have been guilty of faults arbitrarily puniſhable; that is, ſuch as have no expreſs penalty aſſigned by ſtatute.

AFFETTUOSO, or *con* AFFETTO, in the Italian muſic, intimates that the part to which it is added, ought to be played in a tender moving way, and conſequently, rather ſlow than faſt.

AFFIANCE, in law, denotes the mutual plighting of troth between a man and a woman, to marry each other.

AFFI-

AFFIDAVIT ſignifies an oath in writing, ſworn before ſome perſon who is authoriſed to take the ſame.

In an affidavit, the time, place of habitation, and addition of the perſon who makes it, are to be inſerted.

Affidavits are chiefly uſed to certify the ſerving of proceſſes or other matters, concerning the proceedings in a court; and therefore ſhould ſet forth the matter of fact to be proved, without taking any notice of the merits of the cauſe. They are read in court upon motions, but are not admitted in evidence at trials.

Weſtminſter may commiſſion perſons in the ſeveral counties in England, to take affidavits relating to any thing depending in their ſeveral courts.

AFFINITY, *affinitas*, among civilians, denotes the relation of each of the parties married to the kindred of the other.

Affinity is diſtinguiſhed into three kinds: 1. Direct affinity, or that ſubſiſting between the huſband and his wife's relations by blood; or between the wife and her huſband's relations by blood. 2. Secondary affinity, or that which ſubſiſts between the huſband and his wife's relations by marriage. 3. Collateral affinity, or that which ſubſiſts between the huſband and the relations of his wife's relations. The degrees of affinity are always the ſame with thoſe of conſanguinity: hence, in whatever degree of conſanguinity the kindred of one of the parties married are, they are in the ſame degree of affinity to the other.

AFFINITY is alſo uſed to denote a conformity, or agreement, between two or more things: thus, we ſay, the affinity of language, the affinity of words, the affinity of ſounds, &c.

AFFIRMATION, among logicians, is the act of the mind aſſerting the truth or reality of ſomething; or it is a poſitive propoſition, declaring certain proportions or qualities to belong to the thing in queſtion: thus, when I ſay, every circle is a perfectly round figure, I affirm perfect roundneſs to be an inſeparable property of a circle.

AFFIRMATION is alſo uſed for the rectifying or confirming the ſentence or decree of ſome inferior court: thus, we ſay, the Houſe of Lords affirmed the decree of the lords of ſeſſion.

AFFIRMATION alſo denotes a ſolemn atteſtation of the truth of ſome fact, which the Quakers are allowed to make inſtead of an oath.

AFFIRMATIVE, in a general ſenſe, denotes any thing which implies an affirmation. See AFFIRMATION.

AFFIRMATIVE, in the Roman inquiſition, a deſignation given to ſuch heretics as openly avow the opinions they are charged withal.

AFFIRMATIVE *Character*. See the article CHARACTER.

AFFIRMATIVE *Propoſition*. See the article PROPOSITION.

AFFIRMATIVE *Quantity*, in algebra, a real quantity, or a quantity greater than nothing; thus called in oppoſition to a privative or negative quantity, which is leſs than nothing.

AFFIRMATIVE *Sign*, in algebra, is marked thus +, and ſignifies that the quantity it is placed before has real exiſtence, and is called an affirmative quantity. See SIGN and CHARACTER.

AFFORESTING, *afforeſtatio*, in our old lawbooks, is the turning lands into a foreſt, as the converting a foreſt to other uſes, is called diſafforeſting, or deafforeſting.

AFFRAY, or AFFRAYMENT, in law, formerly ſignified the crime of affrighting other perſons, by appearing in unuſual armour, brandiſhing a weapon, &c. But, at preſent, affray denotes a ſkirmiſh or fighting between two or more; and there muſt be a ſtroke given, otherwiſe it is no affray.

An affray is a common injury, puniſhable by the juſtices of peace in their ſeſſions, by fine and impriſonment; and accordingly differs from aſſault, which is a private offence.

A conſtable may ſeize, and carry affrayers before a juſtice; as may likewiſe any private perſon.

AFFRONTEE, in heraldry, an appellation given to animals facing one another on an eſcutcheon, a kind of bearing, which is otherwiſe called *confrontee*, and ſtands oppoſed to *adoſſee*.

AFTER-BIRTH, in midwifery, the membranes which ſurrounded the infant in the womb, more uſually called the ſecundines. See the articles BIRTH, DELIVERY, and SECUNDINES.

In brutes this is called the heam, or cleaning.

AFTER-MATH, in huſbandry, ſignifies the graſs which ſprings or grows up after mowing; or the graſs, or ſtubble, cut after corn.

AFTER-PAINS, in midwifery, exceſſive pains felt in the groin, loins, &c. after the woman is delivered. See DELIVERY.

In order to guard againſt them, phyſicians recommend oil of ſweet almonds, ſpermaceti, troches of myrrh and ſyrup of maiden-hair; and generally with ſucceſs.

AFTER-SWARMS, in the management of bees, are thoſe which leave the hive ſome time after the firſt has ſwarmed. See the articles BEE and SWARM.

AGA, in the Turkiſh language, ſignifies a great lord, or commander. Hence, the aga of the Janizaries is the commander in chief of that corps; as the general of the horſe is denominated ſpahiclar aga. See the articles JANIZARIES and SPAHI.

AGANIPPIDES, in ancient poetry, a deſignation given to the muſes, from a fountain of mount Helicon, called Aganippe.

AGAPES, or AGAPÆ, a word made uſe of in eccleſiaſtical hiſtory, to ſignify thoſe feaſts of charity which were kept by the firſt Chriſtians, when they were a proverb among the heathen, "Look "how theſe Chriſtians love one another!" The term is taken from the Greek word ἀγαπη, which ſignifies love. It was a repaſt which was made at night, in commemoration of our Saviour's laſt ſupper with his diſciples: the rich furniſhed the expence, and the poor were invited. It concluded with a kiſs of peace, and after it the holy ſacrament was received.

Originally theſe love-feaſts were pure and irreproachable, without diſorder or licentiouſneſs: but they gave occaſion at laſt to the heathens to upbraid the Chriſtians, and accuſe them of the vileſt and moſt flagitious practices. They continued for three centuries in the church, but were entirely prohibited by the councils of Laodicea and Carthage.

It is imagined by ſome commentators that St. Paul, in the 11th chapter of the 1ſt of the Corinthians, ſpeaks of theſe feaſts of charity, and not of the euchariſt. Others are of opinion that they were not kept in commemoration of Chriſt's laſt ſupper, but were taken from the pagans. St. Auſtin reports that Fauſtus, the Manichean, reproached the faithful, becauſe they had converted the ſacrifices of the heathens into love-feaſts. It ſeems as if the idea of theſe feaſts of charity was taken from the Jews; who, when they ſacrificed to the true God, kept a feſtival, and aſſembled together their kinsfolk and friends to partake of the ſacrifice. Chriſtianity was firſt planted in Judea; and it is rational to ſuppoſe that the firſt Chriſtians might adopt ſo laudable a cuſtom from the Jews. Being few in number, they conſidered themſelves as one family: they were all brethren, and lived together in common: the ſpirit of charity inſtructed theſe repaſts, where nothing was ſeen but order, temperance, and harmony. As they multiplied, they were ſtill deſirous to keep up their primitive cuſtoms; but abuſe crept in, and the church was obliged to ſuppreſs them.

AGAPETÆ was a name given to thoſe virgins who, thro' a motive of piety and charity, aſſociated with the eccleſiaſtics, and attended upon them. They were originally their neareſt relations; and in the pure days of primitive Chriſtianity they lived together without reproach or ſcandal. In time however they degenerated into libertiniſm; and this promiſcuous ſociety was forbidden by the councils of the church. St. Athanaſius mentions a prieſt named Leontius, who, to remove all occaſions of ſlander, offered to caſtrate himſelf, that he might be permitted to retain his beloved companion.

AGARIC, *Agaricum*, in botany, a genus of epiſtical plants, growing on the trunks of trees, eſpecially the larch-tree, and reſembling the common muſhroom, both in ſubſtance and ſtructure.

Agaric is a fungus, of an irregular figure, three or four inches in length, and as many in breadth and thickneſs. It is extremely ſoft and elaſtic, taking an impreſſion from the leaſt touch, and reſuming its former figure again: its colour, on the outſide, is a pale yellowiſh white, but a pure white within.

It was much uſed by the ancients, as a ſponge; but the preſent practice condemns it, as being not only diſagreeable, but unſafe and pernicious.

Mineral AGARIC, in natural hiſtory, a light marly earth, ſo called on account of its reſemblance to the vegetable agaric, in its colour and ſpungy texture.

It never conſtitutes a ſtratum of itſelf, but is found in cracks and fiſſures of rocks, roofs of caverns, and ſometimes in the horizontal vacuities of theſe ſtrata, in form of a white porous powder.

Mineral agaric is a good aſtringent, and therefore preſcribed in fluxes, hæmorrhages, to dry old ulcers, ſtop defluxions of the eyes, &c.

AGAT, *Achates*, in natural hiſtory, a genus of ſemipellucid gems, variegated with veins and clouds, but have no zones like the onyx.

Agats are formed of a cryſtalline ſubſtance, variouſly debaſed with earths of different colours, to which is to be attributed the variety of their appearance. Thus, ſome have a white ground, as the *dendrachates*, or mocoa-ſtone, the *phaſſachates*, and another ſpecies. Others have a reddiſh ground, as the *hæmachates*, *jardachates*, *corallo-achates*, &c. Others again a yellowiſh ground, as the *cerachates*, and *leonteſeres*. And, laſtly, ſome have a greeniſh ground, as the *jaſpachates*, &c.

AGAT is alſo the name of an inſtrument uſed by the gold wire-drawers; ſo called from the agat in the middle of it, which forms its principal part.

AGAVE, in botany. See ALOE.

AGE, in a general ſenſe, denotes a certain portion, or part of duration, applied to the exiſtence of particular objects: thus, we ſay, the age of the world, the age of Rome, &c. that is, the time, or number of years, elapſed ſince the creation of the world, or the building of Rome. Thus alſo, a man's age is the time he has lived, or the number of years elapſed ſince his birth; and ſo in other inſtances, as the age of a houſe, the age of a tree, &c.

The age of a horſe, deer, &c. is known by ſeveral marks; for which ſee the articles HORSE, DEER, &c.

Chronologers are far from being agreed with reſpect to the age of the world; ſome making it more, ſome leſs. See the article WORLD.

AGE, is alſo uſed in a ſynonimous ſenſe with century. See CENTURY.

AGE likewiſe denotes certain periods of the duration of the world.

Thus, among Chriſtian chronologers, we meet with

with the age of the law of nature, which comprehends the whole time between Adam and Moſes; the age of the Jewiſh law, which takes in all the time from Moſes to Chriſt; and laſtly, the age of grace, or the number of years ſince the birth of Chriſt.

Among ancient hiſtorians, the duration of the world is alſo ſubdivided into certain periods, called ages; of which they reckon three: the firſt, reaching from the creation to the deluge which happened in Greece during the reign of Ogyges, is called the obſcure or uncertain age; the hiſtory of mankind, during that period, being altogether uncertain. The ſecond, called the fabulous or heroic, terminates at the firſt olympiad; where the third, or hiſtorical age, commences.

The ancient poets alſo divided the duration of the world into four ages, or periods; the firſt of which they called the golden age; the ſecond, the ſilver age; the third, the brazen age; and the fourth, the iron age. Not unlike theſe are the four ages of the world, as computed by the Eaſt-Indians, who extend them to a monſtrous length.

AGE alſo denotes certain degrees or periods of human life, commonly reckoned four, viz. infancy, youth, manhood, and old age: the firſt of which extends to the fourteenth year; the ſecond, to the twenty-fifth year; the third, to the fiftieth year; and the fourth, to the ſeventy-fifth year, or rather, as long as a man lives.

AGE, in law, ſignifies certain periods of life, when perſons of both ſexes are enabled to do certain acts, which for want of years and diſcretion they were incapable of before: thus, a man at twelve years of age ought to take the oath of allegiance to the king in a leet: at fourteen, which is his age of diſcretion, he may marry, chooſe his guardian, and claim his lands held in ſocage.

Twenty-one is called full age, a man or woman being then capable of acting for themſelves, of managing their affairs, making contracts, diſpoſing of their eſtates, and the like; which before that age they could not do.

A woman is dowable at nine years of age, may marry at twelve, and at fourteen chuſe her guardian.

If a man or woman acts in any of the abovementioned capacities before the time preſcribed by law, he or ſhe may retract at that time, otherwiſe they are ſuppoſed to agree to it anew, and it ſhall be deemed valid. Thus, if a man marries before fourteen, or a woman before twelve, they may either agree to the marriage or not, at theſe ſeveral ages; and ſo on in other caſes.

At fourteen, a man may diſpoſe of his perſonal eſtate by will, but not of lands. At this age too a man or woman is firſt capable of being a witneſs, and under it perſons are not generally puniſhable for crimes, though they muſt ſatisfy the damage ſuſtained by treſpaſs committed by them.

AGE-PRIER, *Ætatem precari*, is when an action being brought againſt a perſon under age, for lands deſcended to him, he, by motion or petition, ſhews the matter to the court, praying the action may be ſtayed till his full age; which the court generally agrees to. However, as a purchaſer, a minor ſhall not have his age-prier; nor in any writ of aſſize, of dower, or petition; but he may in any action of debt.

By the civil law the caſe is otherwiſe, an infant or minor being obliged to anſwer by his tutor or curator.

Among the Romans it was unlawful to put up for any public office, or magiſtracy, unleſs the candidate had attained to a certain age; which differed according to the offices ſued for. Hence the phraſes conſular age, prætorian age, &c. See the articles CONSUL, PRÆTOR, &c.

AGE *of the Moon*, in aſtronomy, is the number of days that are paſt ſince her laſt conjunction with the ſun, or from the day of her change. See the article MOON.

AGEMOGLANS, *Agiamoglans*, or *Aziamoglans*, in the Turkiſh cuſtoms, Chriſtian children raiſed every third year, by way of tribute, from the Chriſtians tolerated in the Turkiſh empire.

The collectors of this odious tax uſe to take one child out of three, pitching always upon the moſt handſome.

The word agemoglans properly ſignifies a barbarian's child; and out of their number, after being circumciſed, and inſtructed in the religion and language of their tyrannical maſters, are the janizaries recruited. As to thoſe who are thought unfit for the army, they are employed in the loweſt offices of the ſeraglio.

AGENDA, among philoſophers and divines, ſignifies the duties which a man lies under an obligation to perform: thus we meet with the agenda of a Chriſtian, or the duties he ought to perform, in oppoſition to the credenda, or things he is to believe.

AGENDA is more particularly uſed for divine ſervice, in which ſenſe we meet with *agenda matutina & veſpertina*; that is, morning and evening prayers.

AGENT, in mechanics, a power which acts upon other bodies by virtue of its own motion, and by that action cauſes or effects a change therein. See ACTION or MOTION.

Agents are either natural or moral.

Natural AGENTS are all ſuch inanimate bodies, as have a power to act upon other bodies in a certain and determinate manner: ſuch is fire, which has the invariable property or power to warm or heat.

Moral AGENTS, on the contrary, are rational creatures,

creatures, capable of regulating their actions by a certain rule.

These are otherwise called free or voluntary agents.

AGENTS, among physicians and chemists, an appellation given to all kinds of menstruums.

AGENT is also used to denote a person entrusted with the management of an affair, whether belonging to a society, company, or private person; thus we say, agents of the Exchequer, of the Victualling-office, &c.

AGENT *and Patient*, in law, is said of a person who is the doer of any thing, and also the party to whom it is done. Thus, if a man who is indebted to another, makes his creditor his executor, and dies, the executor may retain so much of the goods of the deceased as will satisfy his debt; by which means he becomes agent and patient; that is, the person to whom the debt is due, and the person who pays it.

AGER, in Roman antiquity, a certain portion of land allowed to each citizen. See the article AGRARIAN LAW.

AGER is also used, in middle-age writers, for an acre of land. See the article ACRE.

AGERATUM, in botany, the bastard hemp agrimony, a plant which produces male and female and hermaphrodite floscules in one common empalement; it contains five short hairy filaments, with an oblong germen, in which are situated several angulated oblong downy seeds.—This plant was antiently known among the Greeks by the name of eupatorium; the leaves are recommended as vulnerary and hepatic; also to dissolve hard tumours, and absorb superfluous humidities. The maudlin, which is also called ageratum, is not of this genus, but a species of the achillæa. See ACHILLÆA and MAUDLIN.

AGGER, in the ancient military art, a bank or rampart, composed of various materials, as earth, boughs of trees, &c.

The agger of the ancients was of the same nature with what the moderns call lines.

AGGER was also used in several other senses, as for a wall or bulwark to keep off the sea; for the middle part of a military road, usually raised into a ridge; and sometimes for the heap of earth raised over graves, more commonly called tumuli.

AGGLUTINANTS, *Agglutinantia*, in pharmacy, &c. make a class of strengthening medicines, of a glutinous or viscous nature; which, by readily adhering to the solids, contribute greatly to repair their loss.

AGGLUTINATION, in a general sense, denotes the joining two or more things together, by means of a proper glue or cement.

AGGLUTINATION, among physicians, signifies either the adherence of new substance, or the giving a glutinous consistence to the animal fluids, whereby they become more fit for nourishing the body.

AGGREGATE is much the same as the sum arising from the addition or collection of several things together, the whole of which is called the aggregate, sum, or total.

AGGREGATION, in natural philosophy, is a particular kind of union or association of several things which have no natural connection one with the other by nature; but by some artificial means are collected together so as to form one whole. Thus a house is a body of aggregation, being formed of wood, stone, mortar, &c. which have no natural connection one with the other.

AGGRESSOR, among lawyers, denotes the person who began a quarrel, or made the first assault.

It is a very material point to know who was the first aggressor, and accordingly never fails to be strictly enquired into.

AGIADES, in the Turkish armies, denote a kind of pioneers employed in fortifying camps, and the like offices.

AGIO, in commerce, a term chiefly used in Holland and at Venice, where it denotes the difference between the value of bank-stock and the current coin.

AGIO is also used for the profit arising from the discounting a note, bill, &c.

AGISTMENT, AGISTAGE, or AGISTATION, in law, the taking in other people's cattle to graze, at so much *per* month.

The term is peculiarly used for the taking in cattle to be fed in the king's forests, as well as for the profits thence arising.

AGISTMENT is also used in a metaphorical sense, for any tax, burden, or charge: thus, the tax levied for repairing the banks of Romney-marsh was called *agistamentum*.

AGISTOR, or AGISTATOR, an officer belonging to forests, who has the care of the cattle taken in to be grazed, and levies the monies due on that account.

There are four such agistors in each forest, all created by letters patent, and commonly called guest-takers, or gift-takers.

AGITATION, in physics, a brisk intestine motion of the small corpuscles of any natural body. Thus fermentation and effervescence are produced by a quick agitation of the particles of the fermenting body: fire likewise agitates the most subtile particles of matter. See FIRE.

AGLAOPHOTIS, in botany, a term used sometimes for piony. See the article PIONY.

AGLECTS, AGLETS, or AGLEEDS, among botanists, the same with what is usually called apices. See APICES.

AGLIA,

AGLIA, a term uſed by ancient phyſicians for a whitiſh ſpot in the eye, cauſed by a congeſtion of humours.

AGNATION, *Agnatio*, among civilians, denotes the relation of kinſhip ſubſiſting between the deſcendants of the ſame man, in the male line.

AGNOETÆ, in church hiſtory, a ſect of heretics, ſo called on account of their maintaining that Chriſt, with reſpect to his human nature, was ignorant of many things, and particularly of the day of judgment; an opinion which they built upon the text, Mark xiii. 32. whereof the moſt natural meaning is, that the knowledge of the day of judgment does not concern our Saviour, conſidered in the character of Meſſiah.

AGNOETISM, among eccleſiaſtical writers, ſignifies the doctrine or hereſy of the agnoetæ. See AGNOETÆ.

AGNOMEN, in Roman antiquity, a kind of fourth or honorary name, given to a perſon on account of ſome extraordinary action, virtue, or other accompliſhment. Thus the agnomen Africanus was beſtowed upon Publius Cornelius Scipio, on account of his great atchievements in Africa.

AGNUS, the lamb, in zoology, the young of the ſheep kind; for the proper treatment of which, ſee the article LAMB.

AGNUS *Caſtus*, in botany, the chaſte tree, ſo called on ſuppoſition that it allayed luſt, by cooling the genital parts when heated by ſeminal turgeſcency. In the preſent medical practice it is but little uſed. Botaniſts enumerate five ſpecies of theſe plants, which are all claſſed under the general name vitex. See VITEX.

AGNUS *Dei*, in the church of Rome, a cake of wax ſtamped with the figure of a lamb ſupporting a croſs.

Theſe being conſecrated by the pope with great ſolemnity, and diſtributed among the people, are ſuppoſed to have great virtues; as to preſerve thoſe who carry them worthily, and with faith, from all manner of accidents, to expel evil ſpirits, &c.

AGNUS *Dei*, is alſo a popular name for that part of the maſs, where the prieſt ſtrikes his breaſt thrice, and ſays the prayer beginning with the words *agnus dei*.

AGNUS *Scythicus*, in natural hiſtory, the name of a fictitious plant, reſembling a lamb, ſaid to grow in Tartary.

Kæmpfer, who was in the country, could not by the moſt diligent enquiry, find any account of it; and thefore concludes the whole to be a fiction.

AGONALIA, in Roman antiquity, feſtivals celebrated in honour of Janus, or of the god Agonius, whom the Romans invoked before undertaking any affair of importance.

They ſeem to have been kept three times in the year, viz. on the fifth of the ides of January, on the twelfth of the calends of June, and on the third of the ides of December.

AGONOTHETA, or AGONOTHETES, in Grecian antiquity, was the preſident or ſuperintendant of the ſacred games; who not only defrayed the expences attending them, but inſpected the manners and diſcipline of the athletæ, and adjudged the prizes to the victors.

AGONY, among phyſicians, denotes extreme pain, or the utmoſt efforts of nature ſtruggling with a diſeaſe.

AGONY, in a more limited ſenſe, is uſed for the pangs of death; which are leſs painful than uſually imagined, the body being then incapable of quick ſenſations. See DEATH.

AGONYCLITÆ, or AGONYCLITES, in church hiſtory, a ſect of Chriſtians, in the ſeventh century, who prayed always ſtanding, as thinking it unlawful to kneel.

AGRARIAN *Stations*, *agrariæ ſtationes*, in the Roman art of war, were a kind of advanced guards poſted in the fields.

AGRARIAN *Laws*, among the ſame people, thoſe relating to the diviſion and diſtribution of lands; of which there were a great number: but that called the Agrarian Law, by way of eminence, was publiſhed by Spurius Caſſius, about the year of Rome 268, for dividing the conquered lands equally among all the citizens, and limiting the number of acres which each citizen might enjoy.

Harrington, in his Oceana, thinks an agrarian law the only baſis of liberty; through the want of which, or the non-obſervance of it, the commonwealth of Rome came to ruin. He likewiſe lays down the plan of an agrarian law for England, whereby no man ſhould be allowed to poſſeſs more than 2000 l. a year in lands.

AGREEMENT, in law, ſignifies the conſent of ſeveral perſons to any thing done.

There are three kinds of agreement. Firſt, an agreement already executed at the beginning, as when money is paid, or other ſatisfaction made for the thing agreed to. Secondly, an agreement after an act done by another, to which a perſon agrees: this is alſo executed. Thirdly, an agreement executory, or to be executed in time to come.

An agreement put in writing does not change its nature, but if it be ſealed and delivered, it becomes ſtill ſtronger; nay, any writing under hand and ſeal, or a proviſo amounting to an agreement, is equivalent to a covenant.

AGRICULTURE, in a general ſenſe, denotes the art of rendering the earth fertile by tillage and culture. In this ſenſe, it comprehends gardening, as well as huſbandry. See the articles GARDENING and HUSBANDRY.

AGRICULTURE is more particularly uſed for the management

management of arable lands, by ploughing, fallowing, manuring, &c. See the article PLOUGHING, &c.

Agriculture is a no leſs honourable than profitable art, holding the higheſt eſteem among the ancients, and equally valued by the moderns.

The Egyptians aſcribed the invention of agriculture to Oſiris; the Greeks to Ceres and her ſon Triptolemus; and the Italians to Saturn, or Janus: but the Jews, with more reaſon, aſcribe this honour to Noah, who, immediately after the flood, ſet about tilling the ground and planting vineyards.

Agriculture has been the delight of the greateſt men. We are told, that Cyrus the Younger planted and cultivated his garden, in a great meaſure, with his own hands; and it is well known, that the Romans took many of their beſt generals from the plough,

But not to detain the reader with a needleſs encomium of this univerſally admired art, we ſhall here ſubjoin its principal branches, which will be treated of under their reſpective articles.

Agriculture, then, may be ſubdivided into the proper management of all kinds of arable lands, whether of a clayey, ſandy, loamy, or whatever other ſoil. See the articles CLAY-LANDS, SANDY-LANDS, &c.

2. Of lands employed in paſturage, whether they be meadow-lands, marſhy-lands, &c. See MEADOW-LANDS, &c.

3. Of wood-lands, or thoſe laid out in nurſeries, plantations, foreſts, woods, &c. See the article WOOD-LANDS, &c.

AGRIFOLIUM, or AQUIFOLIUM, in botany. See ILEX.

AGRIMONOIDES, in botany, a plant bearing roſaceous flowers; it is claſſed by Linnæus with the agrimonia.

AGRIMONIA, in botany, agrimony, a genus of plants of different ſpecies; the ſort which is beſt known in the ſhops, grows wild in ſeveral parts of England: the flower, which is roſaceous and pentapetalous, contains a monophylous cup, acurately divided into five ſegments; in the center, two ſtyles reſt on the germen, ſurrounded by twelve capillary filaments, whoſe baſes are inſerted in the calyx. When the flower is decayed, the germen becomes two roundiſh ſeeds, faſtenened to the empalement.

The leaves of this plant make a very pleaſant tea, and are ſaid to be good in the jaundice, in cachectic caſes, and in obſtructions of the liver and ſpleen.

AGRIPPA, a denomination given by ancient as well as modern phyſicians, to children born with the feet foremoſt. See the article DELIVERY.

AGROM, in medicine, a diſorder incident to the people of the Eaſt-Indies, wherein their tongues cleave in ſeveral places.

The remedy for this diſeaſe, which they attribute to an extreme heat in the ſtomach, is to chew the black ſeeded baſilica, and to drink a chalybeated liquor, or the juice of large mint.

AGROSTEMA, in botany, a genus of decandrious plants, according to Linnæus; but better known by the name of lychnis, or campion. See LYCHNIS.

AGROSTIS, in botany, a genus of triandrious plants, whoſe flowers are compoſed of two pointed valves, one ſhorter than the other, terminated with a beard; the germen is round, ſupporting two reflexed ſtyles, with three capillary filaments, and produces ſingle ſeeds edged on both ſides. Theſe plants are very troubleſome weeds in gardens, and is commonly called in Engliſh, couch or quick graſs.

AGROSTAGRAPHIA, among naturaliſts, ſignifies the hiſtory or deſcription of graſſes. Such is that of Scheuchzer, containing an accurate deſcription of ſeveral hundreds ſpecies of graſs.

AGRYPNIA, in a general ſenſe, denotes much the ſame with watchfulneſs, or an inaptitude to ſleep; which is a very troubleſome ſymptom of feveriſh and other diſorders. See the article WATCHING.

AGUAPECACO, in ornithology, a Brazilian bird of the moor-hen kind, about the ſize of a pigeon, very long-legged, with a beak like that of a common hen; its back and the upper part of its wings are brown; and in each wing there is a ſmall horn, or prickle, ſerving the bird as a defenſive weapon.

AGUE, a general name for all periodical fevers, which, according to the different times of the return of the feveriſh paroxyſm, or fit, are denominated quotidian, tertian, or quartan agues. See the article QUOTIDIAN, &c.

Agues are thought to be owing to a ſuppreſſion of perſpiration, as their more immediate cauſe, whether that be occaſioned by a foggy and moiſt air, or by putrid damps; but their *cauſa proxima* ſeems to be an actual corruption of the humours of the body.

Dr. Pringle thinks the beſt way of accounting for the periodic returns, is upon the principle of putrefaction. The heat of the body, he obſerves, varies little, and therefore the corruption produced in any of the humours muſt happen in a determinate time. If we ſuppoſe, that in the paroxyſm, the more corrupted particles of the blood do not all paſs off through the ſkin with the ſweat, but that ſome part of them are diſcharged with the bile; theſe particles coming into the inteſtines, and being from thence taken up by the lacteals, and carried into the blood, may there act as a new ferment and occaſion a return of the fit. Thus, the corruption of the bile may be the effect of the firſt fit, and the cauſe of them that enſue.

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The doctor farther obſerves, that though all moiſt countries are ſubject to agues of ſome kind or other; yet if the moiſture is pure, and the ſummers are not cloſe and hot, they will moſtly appear in a regular tertian ſhape, and be eaſily cured. But if the moiſture ariſes from long ſtagnating water, in which plants, fiſhes, and inſects, die and rot, then the damps, being of a putrid nature, not only occaſion more frequent, but more dangerous fevers, which oftener appear in the form of quotidians, and double tertian, than that of ſingle ones.

It is remarkable how much theſe fevers vary with the ſeaſon; for however frequent, violent, or dangerous they are in the decline of ſummer, or beginning of autumn, when the putrefaction is higheſt; yet before winter they are commonly reduced to a ſmall number, become mild, and generally aſſume a regular tertian form.

AGUE-*Tree*, a name by which ſome call ſaſſafras, on account of its febrifuge qualities.

AGUTI, in zoology, an American quadruped of the rat-kind, of the ſize of the Guinea-pig, which it greatly reſembles: its hairs are rigid and gloſſy, of a mixed colour between red and brown, with more or leſs of black; its whiſkers are like thoſe of the rabbit-kind; but like the hog, its upper-chop is longer than the under one; its upper-lip is ſplit, like that of the hare; its tail is very ſhort, the eyes are prominent, and the legs are altogether, or almoſt naked.

AHICCYATLI, in zoology, an American ſerpent, nearly allied to the hæmorrhous and rattle-ſnake; only that it is larger than the former, and wants the rattle of the latter. Its poiſon is as fatal as any yet known.

AID, in a general ſenſe, denotes any kind of aſſiſtance given by one perſon to another.

AID, or *Ayde*, in law, denotes a petition made in court to call in help from another perſon, who has intereſt in land, or other thing conteſted. This is called *aid prier*, which not only ſtrengthens the party that prays for the aid, but gives the other perſon an opportunity of avoiding a prejudice that might otherwiſe accrue to his own right. Thus, a tenant for life may pray aid of the perſon in reverſion; and a city, or borough, that holds a fee-farm of the king, if any thing be demanded of them, may pray for aid of the king.

AID-DE-CAMP, in military affairs, an officer employed to receive and carry the orders of a general. They ought to be alert in comprehending, and punctual and diſtinct in delivering them.

In the French armies every general is allowed four aids-de camp, a lieutenant-general two, and a marſhal-de-camp one.

AID-MAJOR, the French term for an adjutant. See the article ADJUTANT.

AID, *auxilium*, in ancient cuſtoms, a ſubſidy paid by vaſſals to their lord, on certain occaſions.

Such were the aid of relief, paid upon the death of the lord meſne, to his heir; the *aid cheval*, or capital aid, due to the chief lord on ſeveral occaſions; as to make his eldeſt ſon a knight, to make up a portion for marrying his daughter; and ſo in other caſes.

Royal AID, an appellation ſometimes given to the land-tax.

AIDS, in the menage, are the ſame with what ſome writers call cheriſhings, and uſed to avoid the neceſſity of corrections.

The inner heel, inner leg, inner rein, &c. are called inner aids; as the outer heel, the outer leg, outer rein, &c. are called outer aids.

AIGUISCE, AIGUISSE, or EGUISCE, in heraldry, denotes a croſs with its four ends ſharpened, but ſo as to terminate in obtuſe angles.

It differs from the croſs fitchée, inaſmuch as the latter goes tapering by degrees to a point, and the former only at the ends.

AILE, or AIEL, in law, a writ which lies where a perſon's grand-father, or great-grand-father being ſeiſed of lands, &c. in fee-ſimple the day that he died, and a ſtranger abates or enters the ſame day, and diſpoſſeſſes the heir of his inheritance.

AIR, in phyſiology, from the Greek *αηρ*, ſignifying the ſame thing. A light, fluid, tranſparent body, capable of compreſſion and dilatation, which covers this terreſtrial globe, and ſurrounds it to a conſiderable height.

The ancients conſidered air as an element, tho' it be moſt certain that air taken in the ordinary acceptation, is very far from the ſimplicity of an elementary ſubſtance, notwithſtanding ſome of its parts may merit that denomination. Wherefore air may be diſtinguiſhed into vulgar or heterogene, and proper or elementary.

Vulgar or heterogene air, is an aſſemblage of corpuſcles of various kinds, conſtituting all together a fluid maſs, wherein we live and move, and inſpire and exſpire it alternately: which total maſs, we call atmoſphere. See ATMOSPHERE.

The heterogene ſubſtances of which the air conſiſts, may be reduced to two ſorts: namely, firſt, the matter of light or fire, perpetually flowing from the heavenly bodies. See FIRE. To which ſome naturaliſts add electric and magnetic exhalations from the earth. See ELECTRICITY, and MAGNETISM. Secondly, The infinite number of particles raiſed under the form of vapours or exhalations from the ſea, rivers, minerals, vegetables, or animals; whether by the heat of the ſun, ſubterraneous fires, or chimneys, and other artificial fires. See EXHALATION, and VAPOUR.

Sir Isaac Newton conceives the confused mass of vapours, air, and exhalations, which we call the atmosphere, to be nothing else but the particles of all sorts of bodies, of which the earth consists, separated and kept at a distance by rarefied æther. See ÆTHER.

Elementary air, or air properly so called, is a subtile, homogene and elastic substance, being the basis, or as we may say, the fundamental ingredient of the whole air of the atmosphere, from whence it takes its name.

Sir Isaac Newton observes again, that if it be considered how by the continual fermentations raised in the bowels of the earth, there are real substances raised out of all kinds of bodies; it may not perhaps be thought absurd, that the most permanent part of the atmosphere, which is the true air, should be constituted of these; especially since they are the heaviest of all others, and so must subside to the lower part of the atmosphere, and float upon the surface of the earth, and buoy up the lighter exhalations and vapours to float in great plenty above them: for the air, as in reason it ought to be esteemed the most ponderous part of the atmosphere, because the lowest, so it betrays its ponderosity by making vapours ascend readily in it, by sustaining mists, and clouds of snow, and by buoying up gross and ponderous smoke. The proper air is also the most gross and inactive part of the atmosphere, affording living things no nourishment, if deprived of the more tender exhalations and spirits that float in it: and what more inactive and remote from nourishment than metallic bodies?

Proper air has a multitude of characteristics, the most considerable of which are the following:

If air be close confined in a metalline or glass vessel, it will remain the same, without any alteration, ever preserving the form of air: but this does not hold good of vapours; which, as soon as they grow old, lose their whole elasticity, adhere to the inner surface of the glass, and at length trickle down to the bottom. It is almost the same with the exhalations of other bodies, they becoming in a manner insensible and lost after their elasticity is gone. This is confirmed by many of Mr. Boyle's experiments on the air drawn from grapes, dough, flesh, and other substances: and further still by Dr. Hales's experiments in his Vegetable Statics, &c.

By the means of air terrestrial bodies once on fire, continue to burn, till all their parts which contain any fire are consumed; on the contrary, vapours and exhalations extinguish the quickest fire in an instant, and even red hot iron. Vapours also, instead of being necessary to respiration, as air is, are frequently detrimental thereto, and sometimes occasion suffocation; instances of which we have in burning brimstone, and the grotto *Del Cani*, in Italy, which brings on sudden death.

If air be not a fluid distinct from vapours and exhalations, how comes it that it continues ever the same, after heavy rains accompanied with thunder and lightning? The truth is, when it lightens exhalations are set on fire, and fall on the earth in the form of rain and vapour: but after the rain there is no sensible change in the air, except that it is remarkably purified; it must therefore be of a different nature from terrestrial exhalations.

To speak the truth, our knowledge of the substance and intimate nature of the air amounts to a very small matter; what authors have hitherto said about it being but mere conjecture. There is no way of examining air pure and defecated from the several things which are intermixed with it: consequently there is no saying what is its particular nature.

Dr. Hook will have it to be no other than æther, or that fluid and active matter which is distributed through all the celestial regions. See ÆTHER and MEDIUM.

Considered as such, it is a substance *sui generis*, and independent of any other, incorruptible, immutable, present in all places and in all bodies.

Other philosophers place its essence in its elasticity, and make that its distinguishing characteristic. These suppose that it may be generated, and that it is nothing else but the matter of other bodies, rendered by the changes it has undergone, susceptible of a permanent elasticity. Mr. Boyle produces a number of experiments, which he made himself upon the production of air. What this gentleman calls production of air, is the extraction of a sensible quantity of air from a body wherein there appeared to be none at all, or at least far less than the quantity extracted. He observes that among the different methods proper for this effect, the best are fermentation, corrosion, dissolution, decomposition, ebullition of water and other fluids, the reciprocal action of bodies, especially saline ones, upon one another; he adds, that different solid and mineral bodies, in the parts of which there could not be conceived to be any elasticity, being plunged into corrosive mediums, which also are utterly unelastic, will produce, by means of the attenuation of their parts from their mutual collision, a considerable quantity of elastic air.

Sir Isaac Newton is of the same opinion, according to whom the particles of a dense compact fixed substance, adhering to each other by a powerful attractive force, cannot be separated but by a violent heat, and perhaps never without fermentation; and these bodies rarefied by heat and fermentation are finally transformed into a truly elastic air. On these principles, he adds, gunpowder produces air upon explosion.

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Here then are not only the materials for producing air, but likewiſe the mode of doing it; in conſequence of which air may be diſtinguiſhed into real or permanent, and apparent or tranſitory. For to be ſatisfied that every thing which has the appearance of air, is not really ſuch, the inſtance of the æolipile is ſufficient, where water being ſufficiently rarefied by fire, iſſues out with a ſharp hiſſing, under a form perfectly reſembling that of air; but ſoon after loſes that reſemblance, eſpecially in the cold, and becomes water again by condenſation, juſt ſuch as it was originally. The ſame thing may be obſerved in ſpirit of wine, and other ſubtile and fugitive ſpirits obtainable by diſtillation; whereas real air cannot by compreſſion, condenſation, or any other means, be converted into any other ſubſtance but air. See Æolipile.

And as water may be made to aſſume the appearance of air for ſome time, but ſoon after reſumes its own; ſo it is the ſame with other fluids; the greateſt ſubtilization they can be made to undergo, is reducing them to vapours, which conſiſt in a fluid extremely rarefied, and agitated by a very briſk motion. For in order to render a ſubſtance proper to become a permanent air, it muſt be of a fixed nature; otherwiſe it cannot undergo the neceſſary tranſmutation, but will ſoon fly off and be diſſipated. So that the difference between tranſitory and permanent air, anſwers to that between vapours and exhalations, which conſiſts in this, that the one are dry and the other moiſt. See Vapour and Exhalation.

Many make the elaſticity of air to conſiſt in the figure of its particles. Some will have them to be ſmall locks, like thoſe of wool or raw ſilk; others conceive them to be circumvoluted like ſpiral ſprings, endeavouring to unbind themſelves in virtue of their contexture; ſo that to produce air, is, according to theſe naturaliſts, to produce particles in ſuch a manner diſpoſed, there being none but ſuch that are ſuſceptible of the like diſpoſition. Whence, they add, fluids are altogether incapable of it, on account of the roundneſs, ſmoothneſs, and lubricity of their parts.

But Sir Iſaac Newton advances a different ſyſtem. He does not think ſuch a contexture of parts ſufficient to account for that ſurprizing elaſticity we find in air, which may be ſo rarefied as to occupy a ſpace a million of times greater than that which it poſſeſſed before its rarefaction. But as he inſiſts that all bodies have an attractive and repulſive power, and that theſe two qualities are by ſo much ſtronger as the bodies are more denſe, ſolid, and compact; he thence concludes, that when by heat, or the effect of ſome other agent, the attractive force is overcome, and the particles of the body are ſet ſo far aſunder, as to be no longer within the ſphere of attraction, the repulſive force beginning to act, cauſes them to ſeparate further aſunder, with a force proportional to that by which they before adhered together; and after this manner is permanent air formed. This is the reaſon, ſays the ſame author, why permanent air, conſiſting of proper particles, and formed of denſer bodies than tranſitory air or vapours, is heavier, and a humid atmoſphere lighter than a dry one. See Attraction and Repulsion.

After all, there is to doubt, if the ſubſtance thus extracted from ſolid bodies be true air; in a word, whether it be not tranſitory air, or if permanent air, whether it did not before exiſt in the bodies from whence it is extracted. Mr. Boyle proves from an experiment made in his pneumatic machine with a lighted match, that the ſubtile fume which fire raiſes, even from dry bodies, has not ſo much of ſpringineſs as air, ſince it cannot hinder the expanſion of a ſmall quantity of air incloſed in a bladder which it ſurrounds. Nevertheleſs, in ſome experiment which he made afterwards, by diſſolving iron in oil of vitriol and water, or in aqua fortis, he found a large bubble of air which was truly elaſtic, and which in conſequence of its ſpring, hindered the neighbouring liquor from poſſeſſing its place. A very warm hand applied to it cauſed it eaſily to dilate like other air, and to ſeparate in the liquor into a multitude of bubbles, ſome of which emerged up through the liquor into the open air.

The ſame gentleman aſſures us, that he has ſeparated a truly elaſtic ſubſtance from ſeveral other bodies; as bread, grapes, beer, apples, peaſe, beef, &c. and from certain bodies, by burning them in vacuo, particularly from paper and hartſhorn: however, that this ſubſtance, upon a cloſe examination, proved of ſo different a nature from pure air, that animals included in it, not only could not reſpire but with great pain, but died ſooner than if they had been ſhut up in vacuo, without any air at all.

To this may be added, an obſervation of the Pariſian Royal Academy of Sciences; namely, that elaſticity is ſo far from being a conſtitutive quality of the air, that, on the contrary, if certain heterogene ſubſtances be mixed with the air, it becomes thereby more elaſtic than it is in its utmoſt purity. And M. de Fontenelle aſſerts, in conſequence of ſome experiments made at Paris by M. de la Hire, and at Bologna by Sig. Stancari, that air moiſtened by vapours, is far more elaſtic and capable of expanſion, than when it is pure; nay, in the opinion of M. de la Hire, even eight times more elaſtic than dry air.

But it ſhould be obſerved at the ſame time, that Dr. Jurin explains theſe experiments in another manner, and inſiſts that the conſequence the French philoſophers have drawn from, is by no means a neceſſary one.

All that has been hitherto ſaid, is to be underſtood of air conſidered in itſelf; but, as we have remarked, no air is to be found pure of all mixture,

ture. However, thoſe heterogene ſubſtances, whoſe properties and effects we are to conſider, are, according to the great Boyle, of a very different nature from pure air. Boerhaave comes after, and takes upon him to prove that it is a chaos, a meer jumble of all ſpecies of created bodies. Whatever fire is capable of elevating, riſes into the air; and what body is there able to reſiſt the action of fire? See FIRE, VOLATILE, &c.

Particles of every ſubſtance belonging to the mineral kingdom, muſt be intermixed with air; for all of them, ſalts, ſulphurs, ſtones, metals, &c. are convertible into ſmoak, and conſequently muſt take place among aereal ſubſtances. Gold itſelf, the moſt fixed of all natural bodies, is found among ores, cloſely combined with ſulphurs, and conſequently may be elevated together with that mineral. See GOLD, &c.

It is altogether as certain, that in air there muſt be particles of every ſubſtance belonging to the animal kingdom. For the abundant emanations which are perpetually iſſuing from the bodies of animals, in the tranſpiration continually kept up by the vital heat, are abſorbed into the air; and in ſuch quantities too, during the courſe of an animal life, that, could they be recollected, they would be ſufficient to compoſe a good round number of the like animals. See TRANSPIRATION, EMANATION, &c.

Furthermore, when a dead animal continues expoſed to the air, all its particles evaporate, and are quickly diſſipated; ſo that the ſubſtance which compoſed ſuch animal, whether man, ox, or any other, is almoſt wholly converted into air.

One proof, among a thouſand others, that the air is charged with an infinity of excrementitious particles, is this. At Madrid, we are told, that there are few or no neceſſary houſes, and that their ſtreets are the nightly receptacles of all ordures: Yet that the air ſo ſpeedily carries off thoſe fetid particles, that none of their ſcent remains the next day.

No leſs true is it, that the air is charged with vegetable particles; for 'tis ſufficiently known, how readily thoſe ſubſtances putrefy, and thereby become volatile, without excepting even the more ſolid and vaſcular parts of them.

Of all the emanations which float in the vaſt ocean of the atmoſphere, the principal are ſuch as conſiſt of ſaline particles. Many writers ſuppoſe them to be of a nitrous kind; tho' there is little reaſon to doubt that there are ſome of all ſorts; vitriol, alum, marine ſalt, and an infinity of others.

Mr. Boyle thinks, that there may be a large quantity of compound ſalts, not to be met with on or in the bowels of the earth, formed of the fortuitous concourſe and mixture of different ſaline ſpirits. We frequently find the window-glaſs of ancient buildings corroded, as if eaten by worms; and we know of no particular ſalt that is capable of producing ſuch an effect.

Sulphurs are no inconſiderable part of the aereal ſubſtance, on account of the great number of volcanos, grotts, caverns, and ſpiracles, which are conſtantly belching up fumes of this ſpecies.

Laſtly, the ſeparations, frictions, diſſolutions, and, in general, the mutual operations of various ſubſtances upon one another, may be regarded as the ſources of an inconceiveable quantity of anonymous particles, which riſe and float in the air.

Air, taken in the general acceptation, is one of the moſt conſiderable and univerſal agents in nature, both for maintaining animal life, and producing the moſt important phænomena which happen upon the earth. Its properties and effects, having been the moſt principal objects of the reſearches and diſcoveries of modern philoſophers, they have been reduced to certain laws and demonſtrations, which make no inconſiderable branches of mixed mathematics, under the titles of Pneumatics, Aerometry, &c. which ſee.

Among the properties and mechanical effects of the air, the principal ones are its fluidity, its weight, and its elaſticity.

The great fluidity of the air is manifeſt from the facility with which bodies traverſe it, by the propagation of ſounds, odours, and emanations of every kind that eſcape from bodies; theſe effects imply a body whoſe parts yield to the ſlighteſt effort; and in yielding, move themſelves with the greateſt freedom; and now this is the very thing which conſtitutes fluidity. Air never loſes this property, whether it be kept years together confined in glaſs veſſels, or is expoſed to the greateſt natural or artificial cold, or condenſed by the moſt powerful preſſure. In none of theſe circumſtances, has it ever been found reduced to a ſolidity of parts; this is owing to its rarity, mobility, and the figure of its parts. *See* FLUID.

The Carteſians make fluidity to conſiſt in a perpetual inteſtine motion of the parts, and think they can prove that this character belongs to air. Thus, in a camera obſcura, where the repreſentations of external objects are introduced by a ſingle ray, the corpuſcles with which the air is replete, are ſeen to be in a continual fluctuation. Some moderns attribute the fluidity of the air to the fire which is intermixed with it; without which, ſay they, the whole atmoſphere would harden into a ſolid impenetrable maſs; and indeed it muſt be allowed, that the greater the quantity of fire is that it contains, the greater will its fluidity, mobility, and permeability be; and according as the different poſitions of the ſun augment or diminiſh the degree of fire, the air always receives a proportional temperature, which doubtleſs is the reaſon why on the tops of high mountains, the ſenſes of hear-

ing,

ing, ſmelling, &c. are evidently weakened. See FIRE.

The air, as a fluid, preſſes with the ſame force in all directions. M. Mariotte proves the lateral preſſure of air to be equal to its perpendicular preſſure, by the following experiment. He takes a tall glaſs veſſel, perforated near the middle with a ſmall hole, which when ſtopped up, and the veſſel filled with water, he plunges into it a glaſs tube open at both ends, 'till its bottom extremity is lower than the little hole in the ſide of the veſſel. Then he cloſes the mouth of the veſſel with wax or pitch, with which he likewiſe encompaſſes the tube; ſo that no air can gain admittance between the tube and the neck of the veſſel: Now when the tube is filled with water, and the hole in the ſide of the bottle is opened, the water runs out in part from the tube; but near the lower end of the tube, at the height of the hole, it ſtops, and the whole veſſel remains full. If then the perpendicular preſſure of the air were greater than its lateral preſſure, all the water would be forced out of the tube; but this does not happen, becauſe the air preſſes laterally with the ſame force againſt the hole, ſo that no water can eſcape out of the veſſel.

The weight or gravity of the air, is a property of it ariſing out of its corporeal ſubſtance; for gravity is a property, eſſential to matter, or at leaſt a property that is found in all bodies. See ATTRACTION, GRAVITY, and WEIGHT.

Notwithſtanding we have infinite proofs of the gravitating property of the air continually at hand; yet the diſcovery of it is certainly owing to the moderns. Many of the phænomena which it occaſions, have, it is true, been taken notice of time out of mind. It was known many centuries ago, that upon ſucking the air contained in an open pipe, whoſe lower extremity is immerſed in water, this fluid riſes above its level, and takes place of the air. In conſequence of ſuch obſervation ſucking pumps were contrived, and divers other hydraulic inventions, as Heron's ſyphons deſcribed in his Pneumatics, and the watering-pots known in Ariſtotle's time under the name of *Clepſydræ*, which run or ſtop, as the finger leaves open or cloſes their upper orifice. The reaſon that philoſophers aſſigned for this, was a pretended horror that nature conceives for a vacuum, and rather than endure it, chooſes to make a body aſcend contrary to the ſollicitation of its own gravity. Even Galilæo, with all his ſagacity, could not hit upon any thing more ſatisfactory; for he only aſſigned limits to this dread of vacuity. Having obſerved that ſucking pumps would not raiſe water higher than 16 braſſes, or 34 Engliſh feet, he limited this force of nature to avoid a vacuum, to one that was equivalent to the weight of a column of water 34 feet high, on the baſe of the void ſpace. Conſequently he pointed out a way of making a vacuum, by means of a hollow cylinder, whoſe piſton is charged with a weight ſufficient to detach it from the cloſe bottom turned upwards. This effort he called the meaſure of the force of vacuity, and made uſe of it for explaining the coheſion of the parts of bodies. See CLEPSYDRA, PUMP, VACUUM, &c.

Galilæo however was not altogether ignorant of the weight of the air. He ſhews two ways of demonſtrating it in his Dialogues. The path was eaſy from one diſcovery to another, yet ſtill Galilæo's knowledge of the matter was imperfect.

At length Torricelli fell upon the lucky gueſs that the counterpoiſe which keeps fluids above their level, when nothing preſſes upon their internal ſurface, is the maſs of air reſting upon the external ſurface. He came at it in the following manner: in 1643, this diſciple of Galilæo being ſet upon executing a little experiment on the vacuum formed in pumps, above the column of water, when it exceeds 34 feet, thought of uſing a fluid heavier than water, ſuch as quickſilver. He ſuppoſed that, whatſoever was the cauſe that ſuſtained a column of 34 feet above its level, the ſame force would ſuſtain a column of any other fluid, which weighed as much as the column of water on the ſame baſe; whence he concluded that quickſilver, being about 14 times as heavy as water, would not be kept up higher than 29 or 30 inches. He therefore took a glaſs tube of ſeveral feet in length, ſealed it hermetically at one end, and filled it with quickſilver; then inverting it upright, by preſſing his finger againſt the open orifice, he plunged it into a veſſel of quickſilver, and ſuffering the fluid to run out, the event verified his conjecture; the quickſilver, faithful to the laws of hydroſtatics, deſcended till the column of it above the ſurface of that in the reſervoir, was about 30 inches high.

Toricelli's experiment became famous in a ſhort time. Father Merſenne, who kept up a literary correſpondence with moſt of the literati in Italy, was informed of it in 1664, and communicated it to thoſe of France, who preſently repeated it: the famous Meſſrs. Paſcal and Petit, curious naturaliſts at that time, were the firſt who made it, and varied it different ways. This occaſioned the ingenious treatiſe which M. Paſcal publiſhed at 23 years of age, under the title of, *Experiences Nouvelles touchant la Vuide*, which rendered his name famous throughout Europe.

Torricelli reflecting on the cauſe of this phænomenon, was at length led to conclude; that the weight of the air incumbent on the ſurface of the ſtagnated quickſilver, was the thing that counterbalanced the fluid contained in the tube. See TORRICELLIAN EXPERIMENT.

In reality M. Paſcal, who, in the abovementioned treatiſe, made uſe of the principle of *fuga vacui*, having, as he ſays, ſome glimmering notion

of the weight of the air, quickly adopted Torricelli's idea, and devised several experiments to confirm it, one of which was to procure a vacuum above the reservoir of quicksilver. In this case he found the column sink down to the level; but this appearing to him not sufficiently powerful to dissipate the prejudices of the ancient philosophy, he prevailed on a brother-in-law, M. Perier, to execute the famous experiment of Puy-de-Dome, so universally known as not to need a recital here. M. Perier observes that the height of the quicksilver half way up the mountain was less by some inches than at the foot of it, and still less at the top; so that it was now plain that it was the weight of the atmosphere which counterpoised the quicksilver.

We should not omit some instances of the sagacity of Des Cartes with regard to the phænomenon we have been speaking of. There are proofs that this philosopher was sensible, before Torricelli, of the weight of the air, and of its action for sustaining water in pumps, and tubes closed at the upper end. Amongst his Letters there is one dated in the year 1631, in which he accounts for the suspension of quicksilver, in tubes closed at top, by ascribing it to the weight of the column of air contiuued up to the clouds; the same way he explains, in the same letter, the pressure of a glass filled with hot air, upon a body, care being taken to close all communication with the external air. There are further proofs of this his opinion in several other of his letters. In one of them, not long after Galilæo's Dialogues on Motion were published, Des Cartes rejects the pretended force of a vacuum, advanced by the Italian philosopher, and attributes the adhesion of two polished bodies solely to the pressure of the circumambient atmosphere. Lastly, in a letter wrote soon after that just mentioned, speaking of watering pots wherein the fluid is retained by closing the top orifice, "The "water, says he, is not retained in the vessel by a "*horror vacui*, but by the weight of the air." And in another letter, he puts in a claim to the idea of the Puy-de-Dome experiment. After having desired of M. de Carcavi to inform him of the success of that experiment; which the public rumour had advertised him to have been made by M. Pascal himself, "I had reason, says he, to "expect this from him, rather than from you, "because I first proposed it to him two years ago, "assuring him at the same time, that although I "had not tried it, yet I could not doubt of the "consequence; but as he is a friend of M. Roberval, who professes himself no friend to me, "I suppose he is guided by that gentleman's "passions."

It will not be improper in this place to say something of Franciscus Linus his hypothesis, whereby he pretends to solve the phænomen of the suspension of the quicksilver in the Torricellian experiment. His principles are these:

1. That there is an inseparability of bodies, so that there can be no vacuities *in rerum natura*.

2. That the deserted part of the tube is filled with a small film of quicksilver, which being taken off from the upper part of it, is both extenuated and extended through the seeming vacuity.

3. That by this extended film or rope, as he calls it, of dilated quicksilver, the rest of the quicksilver in the tube is suspended, and kept up from falling into the reservoir.

4. That this funicle or rope is exceedingly rarefied and extended by the weight of the pendent quicksilver, and will, upon removal of that violent cause which so holds it, recontract itself into its former dimensions again, and so draw up what body soever it has hold of along with it; as the effluvia of an electric body, upon its retreat, plucks up straws or any other thing with it, that it is able to wield.

5. That this extension of the film of quicksilver is not indefinite, but hath a certain limit beyond which it will not be stretched; and therefore if the tube be of an exceeding great height, the quicksilver will rather part with another film and extend that, and so a third or fourth, till it comes to the standard of 29 inches, where it rests, having not weight nor power enough to separate another film from it.

These are his principles, and to give a taste of the application of them, we shall add, that his reason why the quicksilver in a tube under 29 inches descends not all, is this; because it sticks with its uppermost surface so close to the top of the tube, that there is not weight enough to break that adhesion; the reason whereof is, because there is nothing to succeed in the room of the descending quicksilver, and therefore it firmly sticks there, *ne daretur vacuum*.

In longer tubes it falls to that standard, because then the greater weight of quicksilver is able to break that contiguity or adhesion, and therefore the uppermost surface of the quicksilver being sliced off, is dilated into a thin column or funicle, which supplies that seeming vacuity.

For the positive arguments to avouch his principles by, Linnius has none at all; and only what he fetches *a posteriori*, from his commodious solution of difficulties, and solving the phænomena better than others have done. This is the funicular hypothesis, and the only one we have met with that pretends to account for the phænomena, by taking off the excess of gravitation of the quicksilver in the tube.

Thus much then may be said, that nature either suspends her settled laws for the production of

these phænomena, or that there is some additional pressure communicated to the quicksilver in the vessel, which can be no other, as has been proved, than the pressure of the air which is contiguous to it; or lastly, that the excess of pressure from the quicksilver in the tube, is by some way or other, which we cannot discover, taken off, or rendered ineffectual.

It is unreasonable to imagine that nature should forsake her wonted paths on so trifling an occasion: it is certain we have no precedents to warrant such a suspicion. When the schoolmen say, nature abhors a vacuum, they must mean by nature, if they mean any thing, either the Author of all created beings, or the creatures themselves; if they would be understood in the first sense, they unavoidably charge Omniscience itself with incogitancy, supposing him to have created the world as continually to stand in need of miracles for its preservation; it being in their own power, as often as they please to make a trifling experiment, to put him to the necessity of interposing to hinder a vacuum. If they mean by nature the creatures themselves, then they must of necessity fall into another absurdity, whilst they suppose brute matter to be intelligent, and to put itself in action in pursuit of some determinate end. This we presume may be sufficient to expose that gross opinion concerning a *fuga vacui*, supposing it could account for the experiments, which it cannot do by any means.

It must be confessed, that Aristotle himself does somewhere assert the gravitation of the air; and to prove his assertion, he appeals to the experiment of a bladder full blown; which, says he, weighing more than when it was flaccid, is a manifest token of the weight of the air contained in it. But it is certain, however unreasonable it may seem, that his followers departed from their master, by asserting the contrary for several ages together.

Galilæo seems to be one of the first who discovered the specific gravity of the air, by different experiments. But the first experiment of this nature, which was generally taken notice of, was that of Mersenne.

He procured to himself on æolipile, or hollow globe of brass, with a very slender neck. See ÆOLIPILE. This he placed in the fire till it became red-hot, and immediately weighed it by a ballance whilst it remained so. Afterwards he let it cool, and then weighed it again; and finding its weight to be greater than before, he concluded that the excess was the weight of the air which had been expelled by the heat, and had been permitted to return again upon the cooling of the globe. Thus he was satisfied that the air was a ponderous body; but in what measure it was so, he could not, by this experiment alone, determine. He therefore repeated the trial again, and found the weight of the globe when it was red-hot to be the same as before. Then he placed the neck of it under water, and suffered it to cool in that posture; which being done, he found his globe to be almost filled with water; and knowing the bulk of that water to be the same with the bulk of the air which was expelled by the heat, upon weighing that water and comparing its weight with the weight of the air found by the former experiment, he concluded the specific gravity of air to be about 1300 times less than the specific gravity of water; whereas, by the experiments of Galilæo, it came out but 400 times less. If we take a mean between these two, we must say it is 850 times lighter; and this agrees very well with later and more exact observations.

Mr. Cotes always found the proportion of water to air, to be between the proportions of 800 and 900 to 1; but it generally approached somewhat nearer to 900.

Mr. Hauksbee took a bottle which held more than three gallons, and of a form something oval; which figure he chose, for the advantage of its more easy libration in water. Into this bottle he put as much lead as would serve to sink it below the surface of the water. And the reason why he chose rather to have the weight of lead inclosed within the bottle, than fixed any where on the outside, was, to prevent the inconveniencies which, in the latter case, must needs have arose from bubbles of air: for these bubbles would have inevitably adhered to, and lurked in great plenty about the body of the weight, had it been placed on the outside, which must have caused some errors in the computations of an experiment that required so much exactness and nicety. These things thus provided, the bottle containing common air closed up, was by a wire suspended in the water, at one end of a very good balance, and was counterpoised in the water, by a weight of 358½ grains in the opposite scale. Then being taken out of the water, and screwed to the air-pump, in five minutes time it was pretty well exhausted, the mercury in the gage standing at near 29½ inches: after which, having turned a cock that screwed both to the bottle and the pump, and so prevented the air's return into it again; it was taken off from the pump, and suspended as before, at one end of the balance in the water. And now the weight of it was but 175½ grains; which, therefore, subtracted from 358½ grains (the weight of the bottle with the inclosed air, before it had been applied to the air-pump) gave, for the difference, 183 grains; which difference must consequently be the weight of a quantity of air, drawn from the bottle by the pump. Having thus determined the weight of the exhausted air, the cock was opened under water; upon which the water was at first impelled with a considerable violence into the bottle (though this force abated gradually afterwards) and continued to

to rush in, till such a quantity was entered, as was equal to the bulk of the air withdrawn. And then the bottle, being examined by the balance again, was found to weigh 162132 grains; from which subtracting 175½ grains (the weight of the bottle with the small remains of included air, after it was taken from the air-pump) there remains 161956½ grains, for the weight of the mass of water, equal in bulk to the quantity of air exhausted. So that the proportion of the weights of two equal bulks of air and water, is as 183 to 161956½, or as 1 to 885.

There are two things particularly observable in this experiment. First, that in making it after this manner, one needs not be very sollicitous about a nice and accurate exhaustion of the receiver; the success of the experiment does not at all depend upon it: for to what degree soever the exhaustion be made, it must still answer in proportion to the quantity taken out. Neither can any more water possibly enter into the receiver, than what will just supply the place, and fill up the room, deserted by the exhausted air. Secondly, the season of the year is to be considered in this experiment. He made it in the warm month of May, the mercury in the barometer standing at the same time at 29,7 inches. From whence it is reasonable to conclude, that a sensible difference would arise, were it to be tried in the months of December or January, when the state and constitution of the air is usually different from what it is in the foregoing months. Dr. Jurin therefore recommends a mean temperature of the air to make the experiment in, and believes that the weight of air would then be found to that of water, nearly as 1 to 800.

Musschenbroek says he has sometimes found the proportion to be as 1 to 606; and observes, that in making the experiment in different years and seasons, he met with a continual difference; but that in experiments made in Europe, the limits will never be wider than 1 to 606, and 1 to 1000.

The laws of the air's gravitation and pressure, as a fluid, must be the same as those of other fluids; and consequently its pressure must be proportional to its perpendicular height. See FLUID.

Moreover this consequence is confirmed by experiments. For if the Torricellian tube be carried to a more elevated place, where the column of air is shorter, the column of quicksilver which it sustains will also be shorter, falling about a quarter of an inch upon an ascent of an hundred feet. On this principle depends the structure and use of the barometer. See BAROMETER.

And from the same principle it likewise follows, that air, like all other fluids, presses equally in all directions. A proof whereof is, that we see soft substances endure its pressure without any alteration of their form, and brittle ones without breaking, notwithstanding the pressure of the column of air on such bodies is equal to that of a column of quicksilver of 30 inches, or to one of water of 33 or 34 feet: but if the pressure be removed or diminished on one side, the effect of it on the other side will be instantaneously perceptible.

From the weight and fluidity of the air conjointly considered, many effects and uses of it may be easily deduced. By the combination of these two qualities, it envelops the earth and all bodies upon it, compresses and unites them with a considerable force. The specific gravity of air being known, the weight of a cubic foot of it will also be known. For if a cubic foot of water weighs 62 pounds, a cubic foot of air will weigh about the 800th part of 62 pounds; whence may be concluded the weight of any certain quantity of air. Likewise the force with which the air compresses all terrestrial bodies, may be determined; for it is evident, that such pressure is the same as if the whole globe were covered with water about 33 feet high. Now a cubic foot of water weighing 62 pounds, 33 feet will weigh 33 times 62 pounds, or about 2046 pounds; and as the earth's surface contains about 5568313666502400 square feet, 2046 times this great number must be taken to get nearly the weight reduced to pounds, with which the air compresses our globe. Now the effect of such a pressure must be very considerable. It prevents, for example, the arterial vessels of plants and animals, from being excessively distended by the impetuosity of the juices, which circulate in them, or by the elastic force of the air, of which a considerable quantity is intermixed with the blood. From air thus mixed with the blood, it is that when, by means of a cupping-glass, the pressure of the external air is in a great measure taken off from one part of the body, that part is distended, and causes an alteration in the circulation of the fluids in the capillary vessels.

The same cause hinders the fluids from transpiring, and escaping through the pores of their containing vessels, as it happens to travellers in ascending high mountains: they find themselves more and more relaxed, as they advance upwards; and at length are seized with spitting of blood, or other hæmorrhages, because there is not sufficient pressure of air on the pulmonary vessels. The same happens to animals shut up in the receiver of an air pump; whilst the air is pumping out, they tumify, vomit, slaver, sweat, and render their urine and other excrements. See VACUUM.

To the same two qualities of the air, weight, and fluidity, is owing the mixture of bodies contiguous to one another, especially fluids. And divers liquids, as oils and salts, which readily mix of themselves in air, but will not mix at all in vacuo.

Also, in consequence of the same two qualities, the

the air determines the action of one body upon another. Thus fire, which burns wood, is put out, and its flame is diſſipated, if the air be withdrawn; becauſe then there is nothing that is able to apply the particles of the fire againſt thoſe of the combuſtible ſubſtance, and hinder the flame from diſſipating. The ſame happens to gold diſſolving in aqua regia; the menſtruum ceaſing to act on the metal as ſoon as the air is drawn off: and it is in conſequence of this determining faculty of the air, that Dr. Papin invented the *digeſter*, which bears his name. See DIGESTER.

On the ſame account it is, that on the tops of very high mountains, ſuch as the Pic of Teneriffe, ſubſtances of the moſt poignant ſavour, as pepper, ginger, ſalt, ſpirit of wine, &c. are in a manner inſipid; for through want of an agent ſufficient to apply their particles on the tongue, and cauſe them to enter its pores, they are rarefied and diſperſed away by the mere warmth of the mouth. The only ſubſtance found to retain its reliſh there is Canary-wine, and this in virtue of its unctuous quality, which makes it adhere cloſely to the palate, and hinders it from evaporating.

The ſame principle of gravity produces alſo, in part, winds, which are nothing elſe but air put in motion through ſome alteration in its equilibrium. See WIND.

Another quality of the air, from whence ariſe a multitude of effects, ſome already mentioned, is its elaſticity, whereby it yields to the impreſſion of other bodies, by contracting its volume; and reſtores itſelf again to the ſame extent, by repelling or weakening the cauſe which had contracted it. This elaſtic force is one of the moſt diſtinguiſhing properties of air; the two other properties before ſpoken of, being common to it with other fluids.

An infinity of proofs evince the exiſtence of this faculty in air. If we preſs, for example, a blown bladder with the hand, we find a ſenſible reſiſtance from the included air; and upon ceaſing the preſſure, the part compreſſed immediately is reſtored to its former ſize.

On this property of the air depends the conſtruction and uſe of the air pump. See AIR PUMP.

Every particle of air makes a continual effort to dilate itſelf, and thereby acts forcibly againſt all neighbouring particles, which alſo exert the like force; but if the reſiſtance happens to ceaſe, or to be weakened, the particle inſtantly becomes prodigiouſly rarefied. This is the reaſon why little glaſs balls, placed under the receiver of an air pump, do, upon pumping out the air, burſt aſunder by the force of the air which they contain. If a cloſe flaccid bladder, containing but a ſmall portion of air, be put under the receiver, it will tumify as the air is exhauſted, and at length appear full. The ſame thing happens if the flaccid bladder be carried to the top of a very high mountain.

The ſame experiment ſhews very manifeſtly, that the elaſticity of ſolid bodies is very different from the elaſtic virtue of air, and that elaſtic ſolid bodies are dilated after a very different manner from air. For when air ceaſes to be compreſſed, it not only dilates, but then occupies a far greater ſpace, and exiſts under an immenſely greater volume than before; which is never obſerved in ſolid elaſtic bodies, thoſe reſuming only the figure they had before they were compreſſed.

The air, ſuch as that near the ſurface of the earth, is rarefied in ſuch ſort, that its volume is ever in the inverſe ratio of the weight which compreſſes it; that is, if air preſſed by a certain weight occupies a certain ſpace, the ſame air preſſed by a weight which is but the half of the former, will occupy a ſpace double that which it occupied in the former caſe. Boyle and Mariotte eſtabliſhed this rule from experiments. The ſame rule takes place in compreſſed air, as Mariotte has alſo ſhewn. However, this rule is not to be admitted as ſcrupulouſly exact; for when air is very forcibly compreſſed, and reduced to a bulk four times leſs than before, the effect does not anſwer preciſely to Mariotte's rule; the air, in this caſe, begins to make a greater reſiſtance, and requires a ſtronger compreſſion, that is, a greater weight than according to the rule; and a moderate degree of attention will ſhew the impoſſibility of the rules being exactly true: for ſuppoſing the air to be ſo ſtrongly compreſſed, that all its particles come in contact with one another, ſo as to form but one ſolid maſs, it can be compreſſed no farther; ſince bodies are impenetrable. It is no leſs evident, that air cannot be rarefied *in infinitum*, and that its rarefaction muſt have its limits; whence it follows, that the rule of the rarefaction being in the inverſe ratio of the compreſſing weight, cannot again be abſolutely exact; ſince, according to this rule, to any given degree of the air's rarefaction, a correſponding weight might be aſſigned which would hinder that rarefaction from becoming greater: but when the air is rarefied the moſt that is poſſible, it is not charged with any weight at all, and yet it occupies a certain ſpace.

We know not how to aſſign any preciſe limits to the elaſticity of the air, nor to deſtroy or any ways alter it. Mr. Boyle made a multitude of experiments, to ſee if he could weaken the ſpring of air extremely rarefied in the receiver of his air pump, by keeping it a long time compreſſed by ſo great a weight as it is aſtoniſhing to think it could endure a ſingle moment; and, after all, he could perceive no ſenſible diminution of the elaſticity. And M. de Roberval having left an air gun charged full 16 years; it, upon being diſcharged, propelled the

ball with as much force as if the air had been newly condenſed.

However, Mr. Haukſbee undertook to prove, by an actual experiment, that the ſpring of the air may be ſo far diſconcerted by a violent preſſure, as not to be able to reſtore itſelf till after ſome time. To this end he took a ſtrong braſs condenſing engine, into which he poured half a pint of water; then, the upper part being ſtrongly ſcrewed on, he threw into it with a ſyringe three or four atmoſpheres of air, as near as he could gueſs; and, in this ſtate, he ſuffered it to remain ſomething more than an hour. Then letting out as much of the air, by taking off the ſyringe, as would readily go away, he preſently ſcrewed on its room a box of leather collars, through which there paſſed a ſmall glaſs tube, open at both ends, whoſe lower orifice was plunged under the ſurface of the included water. After this, in a very little time, he found the water had aſcended very near a foot in the tube, and it continued riſing till it had reached near ſixteen inches.

He concluded from hence, that the elaſtic force of the air had been weakened for ſome time; for had it remained the ſame as at firſt, the whole air would have eſcaped from the veſſel upon opening it; whence it follows, according to Mr. Haukſbee, that what air was left in the veſſel, became after ſome time rarefied, and cauſed the water to riſe in the glaſs tube.

But is it not poſſible, that a conſiderable quantity of the air might have entered into the water, ſince the air which reſted thereon was three or four times more compreſſed than the natural, and was not in a condition to extricate itſelf till after ſome time? ſo that what of it could freely eſcape, did in effect get out of the veſſel whilſt that which had penetrated the water required time to work its way back again. M. Muſſchenbroek having poured quickſilver into a tube eight feet long, one of whoſe ends was recurved and cloſed up, by which the air in the recurved end was compreſſed, ſealed the other end hermetically, marking the degree of the temperature of the air at that time: from which time, he ſays, he conſtantly obſerved that the mercury kept at the ſame height in the tube, when the air had the ſame degree of warmth as when the experiment was firſt made; on the contrary, when the air was warmer, the quickſilver roſe in the tube; whence it ſeems to follow, that the compreſſion of the air does not hurt its elaſticity. However, it cannot be denied that Dr. Hales has proved the poſſibility of the thing, by kindling ſulphur in a glaſs full of air; and, perhaps, there are a great number of exhalations capable of producing the ſame effect.

It is plain, that the weight or preſſure of the air does not at all depend on its elaſticity, and that it is neither more nor leſs heavy than if it were not at all elaſtic. But from its being elaſtic, it follows that it is ſuſceptible of a preſſure, that reduces it to ſuch a ſpace, that the force of its elaſticity, which reacts againſt the preſſing weight, is exactly equal to that weight. Indeed the true law of the elaſticity is, that it increaſes in proportion to the denſity of the air, and that its denſity increaſes in proportion to the forces which compreſs it. But there is a neceſſary equality between action and reaction; that is, the gravity of the air which effects its compreſſion, and the elaſticity of it which gives it its tendency to expanſion, are equal. See DENSITY, and REACTION.

Thus the elaſticity increaſing, or abating, generally in proportion to the augmentation or diminution of the denſity; that is to ſay, as the ſpaces between the particles of the air increaſes or diminiſhes; it matters not, whether or no the air be compreſſed or confined within a certain ſpace, by the weight of the atmoſphere, or by any other cauſe: it is ſufficient, that it tends to expand itſelf with a force equal to that of the cauſe which compreſſes it. For this reaſon, if ſuch air as is near the earth, be incloſed in a veſſel, ſo that it can have no communication with the external air, the preſſure of ſuch incloſed air againſt the inward ſurface of the veſſel, will be exactly equal to the preſſure of the atmoſphere on its outſide. Hence we ſee, that the air of a very cloſe room ſuſtains the quickſilver in the barometer, by its elaſtic force, at the ſame height, as the weight of the whole atmoſphere would do. See ELASTICITY.

According to this principle the air, by proper contrivances, may be condenſed; and upon it, is founded the conſtruction of the air gun. See CONDENSER, and AIR GUN.

To what degree air is ſuſceptible of condenſation, by compreſſion, is not certainly known. Mr. Boyle found means of rendering it thirteen times denſer, by compreſſing it, than it was before: others aſſert, that they have known it reduced to a ſixtieth part of its common bulk. Dr. Hales made it thirty-eight times more denſe, by means of a preſs: but by cauſing water to freeze, in a grenade or hollow bullet of caſt iron, he reduced air to $\frac{1}{1838}$ of its volume, ſo that it muſt have been above twice as ſpecifically heavy as water: and as water is not compreſſible, it follows from this experiment that the aereal particles muſt be of a nature very different from thoſe of water; ſince, otherwiſe, it would be impoſſible to reduce air to a volume above 800 times leſs than its common one; and indeed Dr. Halley, in the Philoſophical Tranſactions, ſays, in conſequence of ſome experiments made in London, and others at Florence in the Academy del Cimento, it may be ſafely affirmed that no force is capable of reducing air into a ſpace 800 leſs than that which it naturally occupies near the ſurface of the earth.

Air, in virtue of its elaſtic force, is dilatable to a very

a very amazing degree. Fire has the property of rarefying it very conſiderably; and, through ſuch rarefaction, air produces the ſame effect as if its elaſtic force were increaſed; and thus it endeavours to extend itſelf in all directions. On the contrary, cold condenſes it, and it may be ſaid, in that circumſtance, to have loſt of its elaſtic force. The force of heated air may be proved by confining it cloſe in a thin glaſs phial, hermetically ſealed, and ſet on a fire; the air then is rarefied ſo forcibly as to burſt the phial in pieces, with a conſiderable noiſe. Likewiſe a bladder half full of air, held near the fire, will not only become tumid by the ſwelling of its air, but will alſo burſt aſunder. M. Amontons found that air made as hot as boiling water, acquired a force which is to that of the weight of the atmoſphere, as 10 to 33, or as 10 to 35; and that the reſult was alike, whether a greater or a leſs quantity of air were made uſe of in the experiment.

Mr. Hauksbee obſerved that a portion of air, incloſed in a glaſs tube, when it began to freeze, formed a volume which was to that of the ſame quantity of air in the greateſt heat of ſummer here in England, as 6 to 7.

M. Amontons aſſerts, that the elaſticity of ſuch air as he calls temperate, is to the elaſticity of air of the ſame heat as boiling water, as 3 to 4 nearly, or, more accurately, as 55 to 73: but Dr. Daniel Bernoulli, from experiments of his own, ſays he has found that the elaſticity of the hotteſt air at Peterſburg, in the midſt of ſummer, has not ſo much elaſticity as M. Amontons aſcribes to temperate air; and is firmly perſuaded, that even under the line itſelf, the air can never acquire ſuch a heat; and, from a courſe of obſervations, he collects that the greateſt variations of the heat of that country, are contained between the terms of 3 and 4; believing that the heat of air, whoſe elaſticity is equal to three-fourths of the elaſticity of air as hot as boiling water, muſt be in a manner intolerable to an animal body.

When air is at liberty, and clear of the cauſe that compreſſed it, it ever aſſumes a ſpherical figure in the interſtices of the fluids in which it is lodged. This is evident in liquors placed in the receiver of an air pump, by exhauſting the air; for at firſt there appears a multitude of extraordinary ſmall bubbles, like grains of fine ſand, diſperſed through the fluid maſs, and riſing upwards; and as more air is pumped out they enlarge in ſize, but ſtill continue round. If a plate of metal be immerged in the liquor, upon pumping, its ſurface will be ſeen covered over with ſmall bubbles, which are nothing but the air which adhered to it, now expanding itſelf.

No means have been neglected to diſcover how far air will be dilated, when entirely free: but the enquiry is ſubject to great difficulties; becauſe our atmoſphere is compoſed of divers elaſtic fluids, which have not all the ſame force; conſequently to know how far air that is pure, and without any mixture, can be dilated, it will be firſt neceſſary to procure pure air, which is no eaſy matter. It muſt next be known in what veſſel, and how, ſuch air muſt be placed, that its particles may be kept ſeparate, ſo as not to act upon one another: indeed many philoſophers have deſpaired of ſolving the problem; nevertheleſs we may conclude, with Muſſchenbroek, from ſome coarſe experiments, that the air near the ſurface of our globe, may expand ſo far as to occupy a ſpace four thouſand times as great as it does in its ordinary ſtate.

Mr. Boyle, from ſeveral experiments, found it dilated nine times, from others 31 times, then from 60 to 150 times; and laſtly, as he ſays, 8000, 10000, and even 13679 times beyond its firſt bulk; and this purely from its innate expanſive virtue, without having any recourſe to fire.

On this principle depends the conſtruction and uſe of the manometer. See MANOMETER.

From the ſeveral before cited experiments, it appears how greatly Ariſtotle was miſtaken, when he pronounced that air ten times rarefied, changes its nature, and becomes fire.

Amontons makes the rarefaction of the air to ariſe from the fire which it contains; ſo that by augmenting the degree of heat, the rarefaction will be encreaſed to a far greater degree than it can poſſibly be by a ſpontaneous dilatation.

From this principle he deduces the conſtruction and uſe of the thermometer. See THERMOMETER.

He firſt of all diſcovered that the more denſe the air is, the more it will be dilated by the ſame degree of heat: in conſequence of which diſcovery he wrote a tract to prove, that the ſpring and weight of the air combined with a moderate degree of heat, may be ſufficient to produce even earthquakes, and other moſt violent commotions in nature. See EARTHQUAKE.

Dr. Hales made many curious and accurate experiments with regard to meaſuring the great quantities of air that were raiſed, or generated, or abſorbed, by the fermentation ariſing from the mixture and variety of ſolid and fluid ſubſtances, whereby he could eaſily eſtimate the ſurpriſing effects of fermentation on the air.

He put into the bolthead *b*, (Plate I. *fig.* 6.) the ingredients, and then run the long neck of the bolt-head into the deep cylindrical glaſs *a y*, and inclined the inverted glaſs *a y*, and bolt-head almoſt horizontal in a large veſſel of water, that the water might run into the glaſs *a y*: when it was almoſt up to the top *a*, of the bolt-head, he then immerſed the bottom of the bolt-head, and lower part of *y* of the cylindrical glaſs under water, raiſing at the ſame time the end *a* uppermoſt. Then

Then before he took them out of the water, he ſet the bolt-head, and lower part of the cylindrical glaſs *a y*, into the earthen veſſel *x x* full of water, and having lifted all out of the great veſſel of water, he marked the ſurface *z* of the water in the glaſs *a y*. If the ingredients in the bolthead, upon fermenting, generated air, then the water would fall from *z* to *y*, and the empty ſpace *z y*, was equal to the quantity of air generated.

But if the ingredients upon fermentation did abſorb or fix the active particles of air, then the ſurface of the water would aſcend from *z* to *n*, and the ſpace *z n*, which was filled with water, was equal to the bulk of air, which was abſorbed by the ingredients, or by the fume ariſing from them. To make an eſtimate of the quantity of air abſorbed, or fixed, or generated, by a burning candle, burning brimſtone or nitre, or by the breath of a living animal, &c. he firſt placed a high ſtand or pedeſtal on the veſſel full of water *x x*; (Plate I. *fig.* 7.) which pedeſtal reached a little higher than *z z*: in this pedeſtal he placed the candle, or living animal, and then whelmed over it the large inverted glaſs *z z a a*, which was ſuſpended by a ſtring, ſo as to have its mouth *r r*, three or four inches under water; then with a ſyphon he ſucked the air out of the glaſs veſſel, till the water roſe to *z z*. But when any noxious thing, as burning brimſtone, aqua-fortis, or the like were placed under the glaſs; then by affixing to the ſyphon the noſe of a large pair of bellows, whoſe wide ſucking orifice was cloſed up, as the bellows were enlarged they drew the air quickly out of the glaſs *z z a a*, through the ſyphon; the other leg of which ſyphon he immediately drew from under the glaſs veſſel, marking the height of the water *z z*. When the materials on the pedeſtal generated air, then the water would ſubſide from *z z* to *a a*, which ſpace *z z a a*, was equal to the quantity of air generated: but when on the contrary, they deſtroyed any part of the air's elaſticity, then the water would riſe from *a a* (the heighth that he at firſt ſucked it to) to *z z*, and the ſpace *z z a a*, was equal to the quantity of air whoſe elaſticity was deſtroyed.

When the matter for trying the experiments was phoſphorus, gunpowder, nitre, &c. the Doctor uſually fired them on the pedeſtal by means of a burning glaſs, which collected the ſun's rays into a focal point on the matter to be fired. He likewiſe made an eſtimate of the quantity of air which aroſe from any body by diſtillation, or fuſion. He firſt put the matter intended to be diſtilled into a ſmall retort *r*, (Plate I. *fig.* 8.) and then at *a* cemented faſt to it the glaſs veſſel *a b*, which was very capacious at *b*, with a hole in the bottom; he bound a bladder over the cement, which was made of tobacco-pipe clay and bean flower, well mixed with ſome hair, tying over the whole four ſmall ſticks, which ſerved as ſplinters to ſtrengthen the joint: matters being thus prepared, holding the retort uppermoſt, he immerged the bolt-head into a large veſſel of water to *a*, the top of the bolt-head; as the water ruſhed in at the bottom of the bolt-head, the air was driven out through the ſyphon; when the bolt-head was full of water to *z*, then he cloſed the outward orifice of the ſyphon with the end of his finger, and drew the other leg out of the water at the ſame time, by which means the water continued up to *z*, and could not ſubſide. Then he placed under the bolt-head while it was in the water, the veſſel *x x*, which done, he lifted the veſſel *x x* with the bolt-head in it, out of the water, and tied a wax thread at *z*, to mark the height of the water; and then approached the retort gradually to the fire, taking care to ſcreen the whole bolt-head from the heat of the fire. As the matter diſtilled, all, except the air, went down into the water in the bolt-head and veſſel, the air that was generated, or deſtroyed, would be ſeen by cauſing the ſurface of the water in the bolt-head to ſtand below or above the point *z*, as at *y*, when all was ſet aſide and cold. For if the body diſtilling generates air of an elaſtic quality, that added to the former will not permit the water *y*, to riſe ſo high as *z*, and the ſpace between *z* and *y* below, will ſhew how much air was produced from its fixed ſtate: but if when all is cold, the ſurface of the water *y* be ſeen above the point *z*, it then ſhews that the diſtilled body did deſtroy, that is, imbibe or abſorb a part of the natural air above *z*; and the ſpace between *z* and *y* filled with water, will ſhew what quantity was changed from a repellent elaſtic to a fixed ſtate. This quantity of generated or abſorbed air, it is eaſy to meaſure in cubic inches, by ſtopping the end of the bolt-head with a cork, and then with a quantity of water of a known weight, to fill it firſt to *z*, and afterwards to *y*, and the difference of weight in the two bulks of water gives the number of cubic inches, from a table of ſpecific gravities.

After the Doctor has given a deſcription, as above, of his inſtruments and method of making experiments, he then gives the event or reſult of a great number which he made with great accuracy. He found that a cubic inch of hog's blood, diſtilled to dry ſcoria, produced 33 cubic inches; that a cubic inch of tallow diſtilled, produced 18 cubic inches of air; that half a cubic inch of the tip of a fallow deer's horn, produced 117 cubic inches, or 234 times its own bulk in air.

A dram of volatile ſalt, of ſal aromatic diſtilled, generated no air, but abſorbed $2\frac{1}{2}$ cubic inches. Phoſphorus fired in a ſmall receiver, expanded into a ſpace equal to 60 cubic inches, and abſorbed 28 cubic inches of air. He likewiſe found that from $\frac{1}{2}$ an inch of oak freſh cut from the growing tree,

was

was generated 108 cubic inches of air; and that from 135 grains of thin ſhavings taken from the ſame piece of oak, and laid before the fire 24 hours, it evaporated 24 grains of moiſture in that time. From 388 grains of Indian wheat, which grew in his own garden, but not come to full maturity, was generated 270 cubic inches of air, the weight of which air was 77 grains, which is one fourth of the weight of the wheat. He likewiſe adds, that from a cubic inch, or 318 grains of peaſe, was generated 396 cubic inches of air, or 113 grains, which is ſomething more than one third of the weight of the peaſe. The Doctor alſo found great plenty of air incorporated into the ſubſtance of vegetables, which by the action of fermentation, is rouſed into an elaſtic ſtate, as is evident from many experiments, and which may be ſeen at length in the Doctor's treatiſe of the Analyſis of the Air.

AIR, in medicine, makes one, and not the leaſt powerful, of the non-naturals; as upon it the very life of animals depends.

It is ſuſceptible of different qualities; hot, moiſt, cold, dry, ſerene, pure, and temperate. It is ſubject to variations, more or leſs ſudden, and to be mixed with impure, corrupted, contagious, metallic, ſulphureous exhalations, which are all prejudicial to health. The beſt quality of the air is to be pure and ſweet, void of all bad exhalations, neither too hot, cold, dry, nor moiſt.

The ſudden changes of the air are inevitable and dangerous; whence proceed a great number of diſeaſes, which reign in the ſpring and autumn, towards the approach of winter. Hoſpitals, camps, places where lead is melted, and the earth juſt thrown up, are generally unhealthy, on account of the bad exhalations. Lighted charcoal, in a cloſe place, fills the air with ſulphureous particles, which are unwholeſome, and ſometimes kill the ſtrongeſt perſons.

Too hot an air diſpoſes to malignant fevers; if it be without moiſture, it produces diary and putrid fevers. Agues are epidemic in the fens of Cambridgeſhire, the hundreds of Eſſex, and in ſome parts of Kent, on account of the vapours, which weaken the fibres of the body, and obſtruct the pores of the ſkin; beſides, a cold and moiſt conſtitution of the air produces coughs, diſtillations, and rheumatic pains.

Hectic and conſumptive people are in great danger, both in very hot and in very cold weather. When the paſſage through the pores of the ſkin is ſtopt by cold, the patient is either apt to fall into a looſeneſs, or to have his legs ſwelled, and the aſthmatic ſymptoms increaſed.

AIR, in mythology, was worſhipped by the pagans, under the names of Jupiter and Juno; the former repreſenting the ſuperior and finer part of the atmoſphere, and the latter the inferior and groſſer part.

AIR, in painting and ſculpture, denotes the manner and very life of action; or, it is that which expreſſes the diſpoſition of the agent. See ACTION.

Some uſe the word to ſignify the geſture or attitude of a figure.

AIR, in muſic, implies the melody proper for ſongs, odes, &c. being uſually quick and lively.

The term is ſometimes uſed to ſignify the ſongs themſelves, called by the Romans, *æra*, whence the word in this acceptation is derived.

AIRS, in the menage, ſignify the artificial motions of taught or menaged horſes; ſuch as the demi-volt, curvet, capriole, &c.

Some extend the term to the natural paces of a horſe, as walking, trotting, galloping; but this is not a proper application of the word, and is accordingly never uſed in the latter ſenſe by the beſt writers.

AIR-BLADDER, a veſicle found in the bodies of all fiſhes, except thoſe of the cartilaginous and cetaceous kinds. It is vulgarly called the ſwim, or ſwimming bladder.

By the aſſiſtance of this bladder, which is always more or leſs replete with air, the fiſh is enabled to ſuſtain its body at any depth. When the fiſh is near the bottom, the great weight of the incumbent water compreſſes its body, or rather the incloſed air-bladder, till the whole fiſh becomes equiponderant with an equal bulk of water. In the middle of the fluid, where the preſſure is leſs, the air-bladder expands; thereby increaſes the bulk of the fiſh, without adding any thing to its weight, till it here alſo becomes equiponderant with an equal bulk of water: and in this manner the air-bladder expands, as the fiſh riſes nearer the ſurface, and by that means ſuſtains it in any depth.

There is however no doubt but fiſhes have a power of expanding and compreſſing the air-bladder, excluſive of the weight of the water, and by that means of riſing or ſinking at pleaſure.

Some fiſhes have only a ſingle air-bladder; ſome a double one; and in others it is triple, or divided into three cells. Fiſhes which lie grovelling at the bottom, have no air-bladders; and it is remarkable, that if the air-bladder be either pricked or burſt, in fiſhes naturally furniſhed with it, they immediately ſink to the bottom; from whence they can never riſe themſelves.

AIR-GUN, a pneumatic machine for exploding bullets, &c. with great violence. See GUN.

Magazine AIR-GUN. See GUN.

AIR-JACKET, a particular kind of leathern jacket, in which there are a great many bags made of leather, which are interſperſed round the

jacket, and have communication with each other: to one of these bags, which are in the form of bladders, is neatly fitted a leather tube or pipe, having a brass stop-cock, air tight, fitted to the extremity; therefore by blowing through this pipe, the bags are filled with air, and by turning the stop-cock, it is confined in the bladders. As the human body differs but very little in specific gravity from water, it will be easy to conceive, that a few of these bladders or bags will reduce them not only to an equal gravity bulk for bulk, but even make it impossible to sink while the machine remains air tight; but if it should, in a length of time, emit the air through the pores of the leather, or by means of any other small imperfection, the pipe and stop-cock is so contrived, that the person wearing this jacket may reinstate the deficiency of the bladders while on the water with great ease. Care must be taken that the bags be wet, before the air is blown into them, otherwise it will immediately escape through the pores of the leather.

AIR-PUMP, in pneumatics, a machine for exhausting the air out of a proper vessel, called a receiver, in order to discover its chief properties and effects on natural bodies. This instrument was invented by Otto Guericke, consul of Magdeburgh, some time before the year 1654; for then this gentleman being employed in a public negotiation at Ratisbon, shewed this instrument to the emperor, and some other princes there present: and in the year 1672, he described his instrument, with a narrative of his trials with it, in a book called, *Experimenta nova Magdeburgica de Vacuo Spatio.*

The first was attempt afterwards executed with great improvements by Dr. Hook, at the instance of Mr. Boyle; and further perfected by Dr. Rapin, Mr. Hauksbee, and lastly, by Mr. Smeaton, F.R.S.

The air-pump commonly made use of now, is that represented by Plate II. *fig.* 3. where AA are the two brass barrels, in which the pistons CC move up and down. The brass tube or pipe marked HH, is called the swan's neck, through which the air passes from under the receiver OO, by a small hole K, in the middle of the brass plate II, on the top of the pump, to a brass piece in the box DD, which being perforated lengthwise to the middle point under each barrel, transmits the air through a bladder-valve to be pumped out. The mercurial gauge which communicates with the receiver, is marked LLL. The stop-cock N, serves to readmit the air, when there is occasion. B is the handle or winch for turning or working the pump. GG are two pillars supporting the frame of the pump-wheel, which is screwed upon them by the two nuts EE. The uses of the other parts will readily be comprehended by inspection of the figure.

It is usual to make the valves in air-pumps of bladder; but it will be found to answer the purpose much better to make them of thin neats skin: for oil is found by experience to harden those made of bladder, which are very apt to crack, and to be often out of order; when, on the contrary, the neats skin valves are kept supple and pliant by the oil, and seldom want repairing. It is likewise customary to use wet leather to place the receiver upon, &c. but we would recommend, that a proper mixture of sweet-oil and bees-wax be melted together over a slow fire, and the leather made supple with this mixture while luke-warm, which will, when cold, be found to answer the purpose much better than wet leather, which greatly damages the works of the pump.

Description of the portable AIR-PUMP. This pump is described by Plate II. *fig.* 4. where AB is the head or part containing the wheel, which alternately rises and depresses the pistons C, D, in the barrels E, F, which are strongly pressed down by the part AB, supported by two the pillars G, H, fixed into the bottom IKL of the machine. On this bottom stands the receiver MN, on a large smooth plate, in the middle of which is a hole by which the air passes out of the receiver into a small tube on the under part of the frame, and goes to the piece O, which communicates with the perforated brass-piece on which the barrels stand, and from which they receive the air to be exhausted: on the middle part of this brass-piece, is a perforation, over which is placed a small receiver PQ, and under it a bason of mercury R, in which a small tube RS, hermetically sealed at one end, and filled with quicksilver, is inverted, and consequently, as the small receiver PQ, is exhausted, together with the large one MN, the approach of the vacuum will be shewn by the falling of the quicksilver in the tube RS: by means of a stop-cock at T, the air is again let into the receiver.

Description of Mr. Smeaton's AIR-PUMP. The principal causes of imperfection in the common air pumps arise, 1st, from the difficulty in opening the valve. 2dly, from the pistons not fitting exactly when put close down to the bottom, thereby leaving a lodgment of air. To avoid these inconveniencies as much as possible, instead of one small valve this pump has seven large ones, all of equal size and shape, one in the center with six round it; so that the bladder valve is supported at proper distances, by a kind of grating made by the solid parts between the holes: also the top of the barrel is shut up with a plate, having a collar of leathers in its middle, through which the rod that carries the piston moves. Thus the external air

is

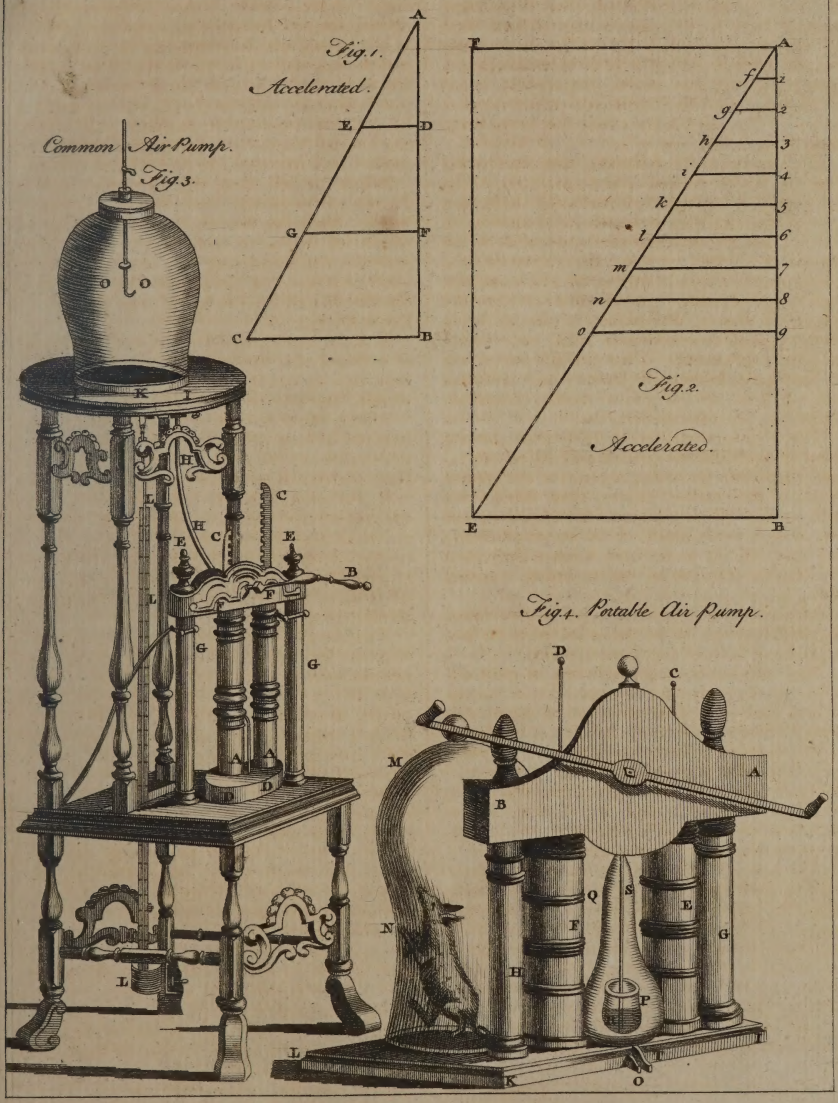
Fig. 1.
Accelerated.
A
E
D
G
F
C
B
Fig. 2.
Accelerated.
F
A
f
g
h
i
k
l
m
n
o
1
2
3
4
5
6
7
8
9
E
B
Common Air Pump.
Fig. 3.
O
O
K
I
H
L
C
E
B
F
G
A
D
L
Fig. 4. Portable Air Pump.
D
C
M
A
B
Q
S
E
F
G
N
H
P
L
K
O

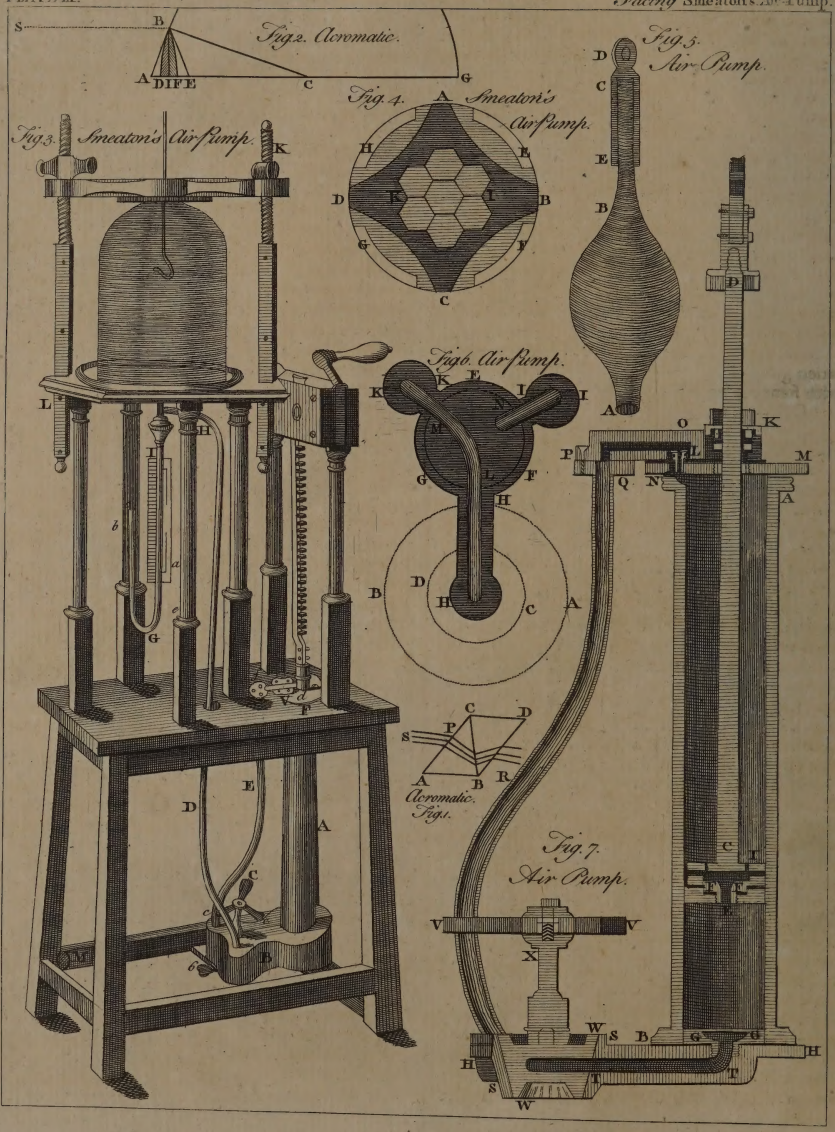
Fig. 2. Acromatic.
Fig. 3. Smeaton's Air Pump.
Fig. 4. Smeaton's Air Pump.
Fig. 5. Air Pump.
Fig. 6. Air Pump.
Acromatic. Fig. 1.
Fig. 7. Air Pump.

is prevented from preſſing upon the piſton, and the air which paſſes through the valve of the piſton from below, may be diſcharged out of the barrel. There is alſo a valve applied to the plate at the top, which opens upwards; and thus the air in the lodgment under the piſton, will evacuate itſelf ſo much more eaſily, as the preſſure upon the piſton valve will be leſs.

Mr. Smeaton found the uſual gauges very unfit for meaſuring the expanſion of the air, where accuracy is required: the following one does it to leſs than the 1000th part of the whole capacity. It is a bulb of glaſs, ſhaped almoſt like a pear, which holds about a pound of quickſilver, and is open at the lower end, with a tube at top, whoſe end is hermetically ſealed. By a nice pair of ſcales, he found the proportion of weight a column of quickſilver of a certain length in the tube, bore to that which filled the whole veſſel, and marked dimenſions on the tube, anſwering each to $\frac{1}{1000}$ of the whole capacity. The gauge during the exhauſting, is ſuſpended in the receiver by a ſlip wire. When the pump has been worked as much as is judged neceſſary, the gauge is puſhed down, till its open end is immerged in a ciſtern of quickſilver placed underneath. The air being let in, the quickſilver will be driven into the gauge, till the air remaining in it becomes of the ſame denſity with the external; and the expanſion will be ſhewn by the number of diviſions occupied by the air at top.

This pump is made to act likewiſe as a condenſer at pleaſure, by ſingly turning a cock; and will then ſhew the experiments of an air gun. See AIR GUN, and CONDENSER.

Explanation of the Figures relating to the Air Pump, in Plate III.

Fig. 3. Is a perſpective view of the principal parts of the pump together.

A, Is the barrel.

B, The ciſtern, in which is included the cock with ſeveral joints.

C, The triangular handle of the key of the cock; which, by marks on its arms, ſhews how it muſt be turned, that the pump may produce the effect deſired.

D H, The pipe of communication between the cock and the receiver.

E, The pipe which communicates between the cock and the valve, on the upper plate of the barrel.

F, The upper plate of the pump, which contains the collar of leathers *d*, and V the valve, which is covered by the piece *f*.

G I, The ſyphon gauge, which ſcrews on and off, and is adapted to common purpoſes. It conſiſts of a glaſs tube hermetically ſealed at *c*, and furniſhed with quickſilver in each leg, which, before the pump begins to work, lies level in the line *a b*, the ſpace *b c* being filled with air of the common denſity. When the pump exhauſts, the air in *b c* expands; and the quickſilver in the oppoſite leg riſes, till it becomes a counterballance to it. Its riſe is ſhewn upon the ſcale I *a*, by which the expanſion of the air in the receiver may be nearly judged of. When the pump condenſes, the quickſilver riſes in the other leg, and the degree may be nearly judged of by the contraction of the air in *b c*; marks being placed at one-half and one-third of the length of *b c*, from *c*; which ſhew when the receiver contains double or treble its common quantity.

K L, A ſcrew frame to hold down the receiver in condenſing experiments, which takes off at pleaſure, and is ſufficient to hold down a receiver, the diameter of whoſe baſe is ſeven inches, when charged with a treble atmoſphere; in which caſe, it acts with a force of about 1200 pounds againſt the ſcrew frame.

M, A ſcrew that faſtens a bolt which ſlides up and down on that leg whereby the machine is made to ſtand faſt on uneven ground.

Fig. 7. Is a vertical ſection of the barrel, cock, &c. where

A B, Repreſents the barrel.

C D, The rod of the piſton, which paſſes through

M N, The plate which cloſes the top of the barrel.

K, The collar of leathers, through which the piſton rod paſſes. When the piſton is at the bottom of the barrel, the upper part of K is covered by the cap at D, to keep out duſt, &c.

L, The valve on the upper plate, which is covered by the piece

O P, Which is connected with the pipe

Q R, Which makes the communication between the valve and cock.

C E, The piſton and

E F F, The piſton valve.

I I, Two little holes to let the air paſs from the piſton valve into the upper part of the barrel.

G G, The principal valve at the bottom of the barrel.

H H, A piece of metal, into which the valve G G is ſcrewed, and cloſes the bottom of the barrel; out of which alſo are compoſed

S, The cock, and

T T, The duct from the cock to the bottom of the barrel.

W, The key of the cock.

X, The ſtem, and

V, The handle.

Fig. 6. Is an horizontal ſection of the cock, through the middle of the duct T T.

A B, Repreſents the ſize of the circular plate that cloſes the bottom of the barrel.

E F G,

E F G, The body of the cock, the outward ſhell being pierced with three holes at equal diſtances, and correſponding to the three ducts H H, I I, K K, whereof

H H, Is the duct that goes to the bottom of the barrel.

I I, The duct that communicates with the top of the barrel.

K K, The duct that paſſes from the cock to the receiver.

L M N, The key, or ſolid parts of the cock, moveable round in the ſhell E F G. When the canal L M anſwers to the duct H H and K K, the pump exhauſts, and the air is diſcharged by the perforation N. But the key L M N being turned till the canal L M anſwers to I I and K K, the perforation N will then anſwer to H H; and in this caſe, the pump condenſes. Laſtly, when N anſwers to K K, the air is then let in, or diſcharged from the receiver, as the circumſtance requires.

Fig. 4. Is the plan of the principal valve.

A B C D, Repreſents the bladder faſtened in four places, and ſtretched over the ſeven holes I K, formed into an hexagonal grating, which may be called the honey-comb.

E F G H, Shew where the metal is a little prominent, to hinder the piſton from ſtriking againſt the bladder.

Fig. 5. Repreſents the pear gauge. It is open at A; B C is the graduated tube, hermetically cloſed at C, and ſuſpended by the piece of braſs D E, hollowed into a cylinder, and claſping the tube.

N. B. A pump of this kind, when clean and in order, has been found to rarefy the air above 2000 times; whereas the common ones, tried by this gauge, have not been found to exceed 150 times.

Theory of the AIR PUMP. Mr. Varignon in the *Memoires de Mathematique & de Phyſique*, for December 1693, gives a general theorem for finding the ratio of the denſity of the air in its natural ſtate to that in the receiver, after a certain number of ſtrokes of the piſton in the barrel; which, if we put $a =$ ſtate of the natural air, $x =$ the ſtate after any number of ſtrokes, $c =$ the capacity of the receiver, $b =$ the capacity of the receiver and barrel together; and $d =$ number of ſtrokes, we ſhall have this proportion, $a : x :: \frac{d}{b} : \frac{d}{c}$. The truth of which is evident, if we conſider that each time the piſton is thruſt down to the bottom of the barrel and raiſed up again, that the air by its elaſtic ſpring will expand itſelf and fill up the cavity made by the piſton; therefore, after each ſtroke of the piſton in the barrel, the remaining air in the receiver and barrel will be to that in the receiver before, as the capacity of the receiver alone, to the capacity of the receiver and barrel together.

Suppoſe $e, f, g, h,$ to be the logarithms of a, x, b, c. Then as $e : f :: gd : hd$. $\therefore e + hd = f + gd$, or $e - f = gd - hd$; where $gd - hd$ is the logarithm of the ratio of the air ſought. In words, the logarithm of the ratio of the denſity of the air in its natural ſtate to that in the receiver after the operation, is always equal to the product of the number of ſtrokes of the piſton, multiplied by the logarithm of the ratio between the capacity of the barrel and receiver together and the receiver alone.

Thus if the capacity of the receiver be 10, that of the barrel 1, and the number of ſtrokes 30; then will the primitive air be found to the remaining, as 1 to $\frac{1}{4}$ nearly.——If the capacity of receiver and barrel were given, and it were required to find the number of ſtrokes of the piſton to rarefy the air to a certain degree; then from the theorem above, $e - f = gd - hd$, we get $\frac{e-f}{g-h} = d =$ the number of ſtrokes required; which is in words, Subtract the logarithm of the remaining air from the logarithm of the primitive air; likewiſe the logarithm of the capacity of the receiver, from the logarithm of the ſum of the capacity of the receiver and barrel together, and then dividing the firſt difference by the latter, the quotient will be the number of ſtrokes required. Thus ſuppoſe the content of the receiver be equal to 600 cubic inches, and the content of the barrel be equal to 30 cubic inches, what number of ſtrokes, or turns of the pump will rarefy the air under the receiver 800 times more than in its natural ſtate? The anſwer will be, 137,007, which is the ſtrokes and part of a turn, required to rarefy the air 800 times more than when in its natural ſtate. If the content of the receiver be required, the other things being given, we ſhall find, from the above theorem, the expreſſion will be $\frac{e-f}{d} + h = g$.

AIR-SHAFTS, among miners, are holes made from the open air to meet the adits, and ſupply them with freſh air.

Theſe air-ſhafts, when the adits are thirty or forty fathoms in length, become abſolutely neceſſary, in order to let in freſh air, and at the ſame give vent to the damps and noxious vapours.

AIR-THREADS, in natural hiſtory, a name given to the long filaments, ſo frequently ſeen in autumn floating about in the air.

Theſe threads are the work of ſpiders, eſpecially of that ſpecies called the long-legged field-ſpider; which, having mounted to the ſummit of a buſh or tree, darts from its tail ſeveral of theſe threads, till one is produced capable of ſupporting the creature in the air; on this it mounts in queſt of prey, and frequently riſes to a very conſiderable height.

Nor

Nor does the ſpider that has thus raiſed itſelf deſcend always by the ſame thread; it often winds that up, and darts out another, more or leſs long, as the creature intends a higher or lower flight.

AIR-VESSELS, in plants, are certain veſſels or ducts for imbibing or conveying air to the ſeveral parts of the plant.

ARIANI, in eccleſiaſtical hiſtory, a branch of the Arians, who, beſides the common tenets of that ſect, denied the conſtantiability of the Holy Ghoſt with the Father and Son.

AIRING, in horſemanſhip, implies the exerciſing a horſe in the open air; a practice that cannot be too much commended.

AIRY, or AERY, among ſportſmen, implies the neſt of a hawk or eagle.

AIRY *Triplicity*, among aſtrologers, denotes the three ſigns Gemini, Libra, and Aquarius.

AISIAMENTA, in law, the ſame with eaſement. See the article EASEMENT.

AIUS LOCUTIUS, the name of a deity to whom the Romans erected an altar.

The words are Latin, and ſignify, "A ſpeaking "voice."

The following accident gave occaſion to the Romans erecting an altar to the Aius Locutius. One M. Beditius, a plebeian, acquainted the tribunes, that, in walking the ſtreets by night, he had heard a voice over the temple of Veſta, giving the Romans notice that the Gauls were coming againſt them. This intimation was however neglected; but after the truth was confirmed by the event, Camillus acknowledged this voice to be a new deity, and erected an altar to it, under the name of the Aius Locutius.

AJUTAGE, or ADJUTAGE, in hydraulics, a ſmall pipe fitted to the aperture of a jet-d'eau, or fountain. See ADJUTAGE and FOUNTAIN.

AJUTANT, in military affairs. See the article ADJUTANT.

AIZOON, in botany, a name given by Linnæus to the ficoidea, and by ſome writers to the ſedums, aloes, &c. It is alſo called ſempervive.

ALA, or ALÆ, in botany, a term uſed in different ſenſes; ſometimes it denotes the hollow between the ſtalk of a plant and its leaves; alſo it is uſed for leaves which conſiſt of many lobes, or wings; ſometimes it is applied to ſignify thoſe petals of papilionaceous flowers between the vexillum and carina; it is likewiſe uſed for the ſlender membranaceous parts of ſome ſeeds, and for thoſe foliaceous membranes which in ſome plants run the whole length of the ſtem, whence it is called *caulis alatus*, *i. e.* a winged ſtalk, *ala* in Latin ſignifying a wing.

ALABASTRA, in botany, a term given to the calyx of flowers before they are expanded, particularly to the roſe-bud.

ALABASTER, *Alabaſtrites*, in natural hiſtory, the name of a genus of foſſils, nearly allied to that of marble. It is an elegant ſtone of great brightneſs, but brittle, tho' it will receive a fine poliſh.

Naturaliſts enumerate ſeveral ſpecies of alabaſter; as, the ſnow-white ſhining alabaſter, or that called the lygdine by the ancients. Boet informs us, that this ſtone is extremely white, and found only in Taurus; but it was formerly brought from Arabia. It is not very compact, but heavy, and conſiſts of a multitude of broad flat large particles, which are very bright and perfectly white. It cuts very freely, and is capable of a fine poliſh. There are very large ſtrata of it in Arabia, Egypt, and many parts of Italy; but it is ſeldom brought over to England.

Whitiſh yellow alabaſter is of a ſoft conſiſtence, and differs in nothing from common marble but in hardneſs, and in its ſhining when poliſhed. It is of a looſe open texture, conſiderably heavy, and nearly of the colour of honey, but more deep in ſome places than others. It conſiſts of irregular pieces lying in tables one over another, and altogether compoſe a remarkable bright and very brittle maſs. Beſides the places above-mentioned, it has been found in Germany, France, and Derbyſhire.

Yellow and reddiſh variegated alabaſter is the common alabaſter of the ancients. It is ſo ſoft that it may be cut with a knife; and has the ſame name in all languages. It is remarkably bright, glittering, and almoſt tranſparent; and its texture very looſe and open, though it is moderately heavy. The ground is of a clear pale yellow, between that of honey and amber, and beautifully variegated with crooked undulated veins, ſome of which are broad, and others narrow; ſome of a pale red, others whitiſh, and others again of a very agreeable pale brown. It will bear a very fine poliſh, and conſiſts of large angular ſparry concretions. It was formerly found only in Egypt, but is now met with in many parts of England.

A-LA-MI-RE, among muſicians, is the name of a note in the modern ſcale of muſic. See GAMUT.

ALAMODE, in commerce, the name of a very thin, gloſſy, black ſilk, chiefly uſed for women's hoods and men's mourning ſcarfs.

ALARES *Muſculi*, in anatomy, the Latin name of the muſcles generally called pterygoidei. See the article PTERYGOIDEUS.

ALARM, in military affairs, implies either the apprehenſion of being ſuddenly attacked, or the notice of ſuch an attack, ſignified by the firing of a cannon, muſket, &c.

Falſe alarms are frequently made uſe of to harraſs the enemy, by keeping them continually under arms.

ALARM-BELL, the bell rung upon any ſudden

emergency, as a fire, mutiny, approach of an enemy, or the like.

ALARM-POST, the place appointed for drawing up a regiment in caſe of an alarm.

ALARM, the name of a kind of clock, contrived for waking people at a certain hour, by making an uncommon noiſe, &c.

ALATED *Leaves*, in botany, are thoſe compoſed of ſeveral pinnated ones. See PINNATED.

ALATERNUS, in botany, the ever green privet, a plant that produces male and female flowers; the male are compoſed of a monophylous funnel ſhap'd cup, cut in five ſegments at the brim, ſurrounding five ſmall petals with the ſame number of filaments; the female flowers have the appearance of the male, but when examined, are without any ſtamina, having a trifid ſtyle placed on the germen, which afterwards becomes a round, ſoft berry containing three ſeeds.——This plant is very common in England, and vulgarly called phillyrea; the moſt diſtinguiſhed difference between them is, that the leaves of the true phillyrea are placed oppoſite in pairs on the branches, whereas the leaves of the alaternus are ſituated alternately, whence the name is ſuppoſed to be derived.—The variegated ſort, (commonly called the ſtriped phillyrea) which is a beautiful plant, is encreaſed by layers, and the other ſpecies by layers or ſeeds; this genus of plants are claſſed by Linnæus with the rhamnus. See the article RHAMNUS.

ALBANENSES, the name of certain heretics, who troubled the peace of the church in the ſeventh century. They revived in a great meaſure the errors of the Manicheans, and other ſectaries, which had been dropt for near three hundred years. Their firſt reverie conſiſted in eſtabliſhing two principles, the one good and the other evil; to the latter they attributed all the books of the Old Teſtament, which they rejected with abhorrence; the former they ſaid was the father of Jeſus Chriſt, the fountain of good, and author of the New Teſtament. They affirmed that the world had exiſted from eternity; denied any reſurrection of the body; and held with Pythagoras, the tranſmigration of ſouls. They aſſerted, that a man has a power of giving himſelf the holy ſpirit; and that the accounts we read of hell are all fable and fiction; with other tenets equally unchriſtian, wild, and ridiculous.

ALBANI, in antiquity, a college of the Salii, or the prieſts of Mars, ſo called from Mount Albanus, the place of their reſidence.

ALBATI, a ſort of Chriſtian hermits, who flouriſhed in the year 1399, during the pontificate of Boniface IX. The were ſo called from the white linen which they wore. They came down from the Alps into ſeveral provinces of Italy, under the conduct of a prieſt cloathed in white, and holding a crucifix in his hand. The followers of this prieſt, whoſe great zeal made him looked upon as a ſaint, multiplied ſo faſt, that it alarmed the pope, who, ſending ſoldiers, apprehended and put him to death; upon which his followers immediately diſperſed. Theſe monks profeſſed ſorrow and weeping for the ſins and calamities of the times: they eat together in the highways, and ſlept promiſcuouſly.

ALBE, a ſmall piece of money, current in Germany, worth about three halfpence.

ALBERTUS, a gold coin, worth about fourteen ſhillings; it was coined during the adminiſtration of Albertus, archduke of Auſtria.

ALBIGENSES, a ſect of heretics who ſprung up in the twelfth century: they were ſo called from one Oliver, a diſciple of Peter de Valdo, or Waldius, who firſt ſpread his errors at Albi, a city of Languedoc, on the banks of the Tarne.

If we believe the catholic writers, this ſect was the very hodge-podge, or ſcum of all the heretics, that have ſtarted up ſince the firſt propagation of chriſtianity. It contained the eſſence of all the errors which had been advanced by the Baſilidians, Arians, Manicheans, &c. mixed up with a thouſand abſurd ingredients of their own invention. Yet bad as it was, it gained ſo conſiderable a ground againſt the corruptions of the Romiſh church, and the profligacy of their clergy, that it was not ſuppreſſed without great bloodſhed and murthers. They were at firſt ſupported by Raimond, count of Toulouſe, when the catholics agreed upon a holy league, or cruſade againſt them. He was joined by the king of Arragon, but was defeated at the ſiege of Muret, where he was killed, and the defeat followed by the ſurrender of the city of Toulouſe, and the conqueſt of the greateſt part of Languedoc and Provence. His ſucceſſor agreed with the pope to ſet up the inquiſition in his ſtate, and to extirpate the Albigenſes. In an aſſembly held at Milan, the archbiſhop of Toulouſe drew up articles, agreeable to which the count made a moſt ample declaration againſt them, which he publiſhed at Toulouſe in 1253. This compleated the ruin of the Albigenſes.

ALBITROSSE, the name of a bird, very common in ſeveral parts of the Weſt-Indies; but not reduced to any certain genus.

ALBORAK, among Mahometan writers, the beaſt on which Mahomet rode in his journey to heaven.

ALBUGINEA *Tunica*, in anatomy, the third or innermoſt coat of the teſticles, ſo called from its white colour.

ALBUGINEA is alſo a name given by ſome anatomiſts to one of the coats of the eye, called alſo adnata. See the article EYE.

ALBUGO, among phyſicians, denotes a diſtemper of the eye, cauſed by a white, denſe, and opaque ſpot, growing on the tunica cornea.

The word is formed from the Latin *albus*, white.

This is a troublesome disease, which is more or less offensive to the sight, according to the greater or less portion of the transparent part of the cornea affected by it: for sometimes it fixes on the exterior surface only of this membrane, sometimes on the interior, and sometimes it runs more or less deep into it.

It is most commonly the consequence of inflammations, by the extravasation of humours between the membranes of this tunicle, and particularly in the small-pox, by the suppuration of pustules upon this part.

I have, says the learned Dr. Mead, made use of two methods of cure for this disorder of the sight; the one in the outward sort, the other in the inward. In the former case I ordered the following powder:

Take of common glass any quantity; pound it in a mortar, into a very fine powder; then add an equal quantity of white sugar-candy, and levigate the mixture on a marble with great labour, till it becomes quite impalpable.

A little of this powder, put into the eye with a quill every day, gradually absterges and wears off the spot by its inciding quality. The other method above-mentioned of removing this speck is, to order a dexterous surgeon to pare it cautiously every day with a knife; for this tunicle is composed of several lamellæ one over another, and has thickness enough to bear paring off some of its parts. I have seen several instances of cures by the eye-powder, but the paring of the coat has not succeeded with me above once or twice. However, it is better to try a doubtful remedy than none. *Mead's Monita & Præcepta.*

ALBUM *Græcum*, in the old materia medica, the white dung of dogs, said to be good for inflammations of the throat; but it is little regarded at present.

ALBUMEN, a term used by medical writers for the white of an egg.

It is used in collyriums, on account of its cooling and agglutinating quality: it is also often an ingredient in ointments for burns.

ALBURN, the English name for a sort of compound colour, formed by mixing red and white.

ALCAICS, a name given to several different kinds of metre, which were made use of by the Greeks and Latins: they are so called from the inventor of them Alcæus, a famous Lyric poet, born at Mitylene, in the island of Lesbos, about the 44th Olympiad. He was cotemporary with the celebrated Sappho; and left several works behind him, of which only a few fragments are now remaining. He was an inveterate enemy to tyrants, and particularly to Pittacus and Periander; for which reason, Horace mentions him thus:

——— *Alcæi minaces*
Stesichorique graves camœnæ.

The first species of Alcaic verse is of four feet, and consists of a spondee or trochee, a bacchius, and two dactyles, as thus:

Jūstūm ēt | tĕnācēm | prōpŏsĭ | tī vĭrum.

In every stanza, where this kind of metre is used, the two first verses are of this sort; the other two verses differ, the third being an iambic dimeter hypercatalectic, i. e. with a long syllable over and above, as

Nōn vūl | tŭs īn | stāntīs | tyrān | ni.

And the fourth verse an alcaic, which consists of two dactyles and two trochees, or a trochee and a spondee, as,

Mēntĕ quă | tīt sŏlĭd | ā, nĕc | Aūster.

The following is a complete alcaic stanza,

Vēstēr | cămōēnāē, | Vēstĕr ĭn | ārdŭos.
Tōllōr | Săbīnōs; | seū mĭhĭ | frīgĭdum.
Prāēnēs | tĕ, seu | Tībūr | sŭpī | num,
Sēu lĭquĭ | dāē plăcŭ | ērĕ Bāiae!

Besides these two sorts of alcaic verse, which are called dactylic, there is another called simply alcaic, which consists of an epitritus secundus, two choriambuses, and a bacchius; as thus,

Fīlĭūm dī | cūnt Thĕtĭdīs | sūb lăcrĭmō | să Trōjāē.

ALCAIC *Ode*, a kind of manly ode, composed of several strophes, each consisting of four verses; the two first of which are always alcaics of the first kind; the third verse is a dimeter hypercatalectic, or consisting of four feet and a long syllable; and the fourth verse is an alcaic of the second kind. The following strophe is of this species, which Horace calls *minaces Alcæi camœnæ.*

Non possidentem multa vocaveris
Rectè beatum: rectiùs occupat
Nomen beati, qui deorum
Muneribus sapienter uti, &c. Hor.

ALCAID, ALCAYDE, or ALCALDE, among the Spaniards and Portuguese, is a magistrate, or officer of justice, answering nearly to our justice of peace. The alcaid is properly a Moorish officer, where he is invested with supreme jurisdiction, both in civil and criminal cases.

ALCALI, or ALKALI, a general appellation given by physicians and chemists to all substances, which, on being mixed with acids, excite an effervescence.

The word originally signified the salt extracted from the ashes of *kali*, or glasswort: but was afterwards applied to all salts that effervesced with acids.

Alcalies are generally divided into two kinds, and distinguished by the epithets of *fixed* and *volatile*.

Fixed ALKALIES are distinguished from saline substances not alcaline, by their effervescing with all acids, forming with them neutral salts, precipitating

pitating solutions made in acids, and changing syrup of violets green.

They are distinguished from volatile alcalics by their fixity and fusibility in the fire, by their deliquiating in the air, and never assuming a crystalline form, changing solution of mercury sublimate not white, but of an orange yellow, producing no blue colour with copper or its solutions, raising no visible cloud when placed near an unstopt bottle of nitre, occasioning no coldness but rather heat on being dissolved in water. Pure fixed alcalies, dissolved in water, mingle with a solution of any other pure alcali, without the least precipitation, turbidness, or sensible change.

They form, with acids, different neutral salts, according to the nature of the acid employed; with the vitriolic, a bitterish salt, very difficult of solution in water, and not fusible in the fire, commonly called vitriolated tartar, the alkaline salt made from tartar being that which has chiefly been employed for these purposes; with the nitrous acid, they form a perfect nitre; with the marine, a salt greatly resembling sea-salt, being in some respects different from the common vegetable alkalies. They readily crystallize with any of the mineral acids, and with tartar; with which last they compose a neutral salt, much easier of solution than the tartar itself, and hence called soluble tartar. They do not easily crystallize with the acid of vinegar or lemon juice; these mixtures, if by careful management reduced to a crystalline form, soon deliquiate again in the air.

Preparation of fixed ALCALIES. The most commodious method of preparing fixed alkaline salts in the large way, seems to be that directed by Kunckel in his Art of Glass. The ashes of wood, or the woody part of vegetables, either burnt on purpose or as common fuel, are to be put into a large tub or vat, whose bottom is covered with pieces of split wood and straw, to prevent the ashes from stopping up the cock. So much water is to be poured on the ashes as may totally cover them: after standing for a night, the liquor, impregnated with their saline part, is to be let off by the cock at the bottom into another vessel; and the elixation repeated with fresh water so long as the ley has any saline taste. The elixated ashes may be used, like common wood-ashes, for manure; and the weak leys may be rendered stronger, by pouring them, instead of plain water, upon a fresh quantity of ashes. Thus from every parcel of ashes we obtain a strong ley, with a weaker one to be returned on the next. Where the ley is to be kept in its liquid state, wooden vessels (according to him) are more commodious than earthen ones, however glazed; these last being sooner corroded and penetrated by the acrid liquor.

In procuring a solid salt, the ley is to be evaporated in an iron pan, fixed in brick-work; fresh ley being continually supplied during the evaporation, in a very slender stream, from a cask placed on the brick-work, till the quantity of salt is as large as can be conveniently dried in the vessel. This impure brown or blackish salt is to be calcined in a furnace built for that use, with a red heat just not strong enough to melt it, and every now and then turned up and stirred for six or seven hours, or till some of the larger pieces, taken out and broke, appear internally white. Thus we obtain an alkali sufficiently pure for all the businesses in which these kinds of salts are employed: if, for particular purposes, a further purification should be required, it may be dissolved, inspissated, and calcined afresh. The rough salt loses, in the first calcination, commonly about one tenth of its weight.

Some soak in the ley a quantity of straw, beanstalks, or other like substances, sufficient to imbibe it; and, by drying and burning these, obtain the salt of the ley, without the trouble of boiling it down. The earthy matter left by the straw is, in quantity, inconsiderable, and, for many purposes, of no injury to the salt, particularly for soap-boiling, bleaching, &c. where the salt is dissolved, and consequently purified from indissoluble earthy admixtures before it is used. There is nevertheless one great inconvenience in the process; the straw, when loaded with the alkali, being very difficultly made to burn. Vegetable substances in general, when fully impregnated with fixed alkaline salts, never flame; and do not burn at all without a continuance of external heat, insomuch that some have proposed the impregnating of wood for buildings with salts, as an effectual means for preventing its receiving or communicating fire.

The strength of leys, or the quantity of salt dissolved in them, may be estimated by the weight of a certain measure of them, compared to the weight of an equal measure of water; or more commodiously, and perhaps as accurately, by means of an hydrometer graduated from actual trials with leys of known strength. *Neumann's Chemistry.*

Volatile ALCALIES, are salts formed by a new combination of the constituting particles of a natural body, by the operation of putrefaction.

Volatile alkalies from whatever substance obtained, are all alike, and have the same properties; differing only according to their degrees of purity. The volatile alkali, as well as the fixed, consists of a certain quantity of acid, combined with and entangled by a portion of the earth of the mixed body from which it was obtained; and on that account it has many properties like those of a fixed alkali. But there is, moreover, in its composition, a considerable quantity of a fat or oily matter, of which there is none in a fixed alkali;

alkali; and, by this means, there is a great difference between them. Thus the volatility of the alkali produced by putrefaction, which is the principal difference between it and the other kind of alkali, whose nature it is to be fixed, must be attributed to the portion of oil which it contains: for there is a certain method of volatilizing fixed alkalies, by means of a fatty substance.

Volatile alkalies have a great affinity with acids, unite therewith rapidly and with ebullition, and form with them neutral salts, which shoot into crystals, but differ from one another according to the kind of acid employed in the combination.

The neutral salts which have a volatile alkali for their basis are in general called ammoniacal salts. That whose acid is the acid of sea-salt, is called sal ammoniac. As this was the first known, it gave name to all the rest. Great quantities of this salt are made in Egypt, and thence brought to us. They sublime it from the soot of cows-dung, which is the fewel of that country, and contains sea-salt, together with a volatile alkali, or at least the materials proper for forming it; and consequently all the ingredients that enter into the composition of sal ammoniac. See the Memoirs of the Academy of Sciences.

The neutral salts formed by combining the acids of nitre and of vitriol with a volatile alkali, are called after their acids, nitrous sal ammoniac and vitriolic sal ammoniac: the latter, from the name of its inventor, is called Glauber's secret sal ammoniac.

ALCANNA, in commerce, a powder prepared from the leaves of the Egyptian privet, in which the people of Cairo drive a considerable trade. It gives a yellow colour, when steeped in common water; and a red one when infused in vinegar or alum water. They also extract an oil of a very agreeable odour from the berries of the alcanna, and use it in medicine.

Knights of ALCANTARA, a military order in Spain. The knights of this order make a very considerable figure in the history of the Spanish expeditions against the Moors.

ALCE, in natural history, the name of an animal, generally called the elk. See the article ELK.

ALCEA, the hollyhock in botany, a biennial plant of the mallow kind; it grows to the height of eight or nine feet, ornamented with large rosaceous flowers, which are pentapetalous: those that are most esteemed produce double flowers of various colours, which make a magnificent appearance in July and August, the seeds of which should be sown in the spring, and in the succeeding autumn planted where they are designed to remain for flowering. The vervain mallow, called also alcea, is not of this genus, but a species of the mallow. See the article MALLOW.

ALCHEMILLA, ladies mantle, in botany, a genus of tetandrious plants; the common sort, which grows in several parts of England, has roots that are composed of many thick fibres, which greatly spread in a proper soil; the leaves supported by long foot stalks, are roundish and scolloped about their extremities, arising immediately from the root, from between which the flower stems shoot forth about a foot high, divided into many branches; the cup of the flower is monophyllous and herbaceous, cut into eight segments: it is destitute of petals, but in the center of the empalement is situated an oval germen, into which is inserted a long style, crowned with a globular stigma, surrounded by four upright filaments, resting on the edge of the empalement, and topped with roundish summits: when the flower is decayed, the germen becomes a single, compressed seed. This plant is recommended by some as an excellent vulnerary, and is said to consolidate, astringe, and thicken the blood, which makes it be prescribed in hæmorrhages and other fluxes.

ALCHEMIST, a person who professes, or practises the art of alchemy.

ALCHEMY, the sublimer, or more abstruse parts of chemistry. See the article CHEMISTRY.

The word is formed from the Arabic particle *al*, which signifies sublime, or excellent, and *chemy*, chemistry. The term therefore properly signifies *the sublime chemistry*, or *the chemistry*, by way of excellence.

ALCIS, in mythology, the name under which Minerva was worshipped by the Macedonians.

ALCMANIAN, in ancient lyric poetry, a species of verse consisting of two dactyls and two trochees. The following is of this kind:

Virgini | bus pue | risque | canto.

ALCOHOL, in chemistry, signifies spirit of wine rectified by repeated distillations, till it has acquired the utmost subtilty and perfection possible.

By these repeated rectifications, it is not only freed from its redundant phlegm, but also from some particles of acid and oil, which, though much less volatile than itself, ascend with it in the first distillation; nor is it possible wholly to avoid this inconvenience. See SPIRIT.

ALCOHOL also signifies a very fine impalpable powder. The oriental ladies use antimony, reduced to an impalpable powder, for blacking their eye-lids, and call this powder alcohol.

ALCOLA, a term used by some alchemists for the tartar of urine, found in small grains of a reddish colour.

ALCOR, in astronomy, the Arabic name of a star of the 5th magnitude, adjoining to the large

bright ſtar in the middle of the tail of the great bear, or *urſa major*. We are told in Wolfe's Lex Math. page 34, that it is a proverb among the Arabians, "That thou can ſee alcor, and yet not "ſee the full moon:" which they apply to ſuch perſons, who are apt to ſee ſmall things, and overlook much greater.

ALCORON, AL-CORAN, or AL-KORAN, the ſcripture, or bible of the Mahometans.

The word is compounded of the Arabic particle *al*, and *coran*, or *koran*, derived from the verb *caraa*, or *karaa*, to read; the true ſenſe therefore of the word is, *the reading*, or that which ought to be read.

The alcoran is divided into 114 large portions, of very unequal length, which we call chapters, but the Arabians *ſowar*, which properly ſignifies a row, or ſeries. Theſe chapters, in the manuſcript copies, are not diſtinguiſhed by their numerical order, but by particular titles, which are ſometimes taken from ſome principal matter treated of, but generally from the firſt word of note that occurs.

Every chapter is ſubdivided into ſmaller portions, which we uſually call verſes, but the Arabians, *aiat*, which ſignifies ſigns or wonders; ſuch are the ſecrets of God, his attributes, works, &c. delivered in thoſe verſes.

The alcoran is univerſally allowed to be written in the pureſt language, and to be the ſtandard of the Arabic tongue. The ſtile is, in general, beautiful and fluent, eſpecially where it imitates the prophetic manner, and Scripture phraſes. It is conciſe, and often obſcure, adorned with bold figures after the eaſtern manner, enlivened with florid and ſententious expreſſions, and in many places, eſpecially where the majeſty and attributes of God are deſcribed, ſublime and magnificent.

The general deſign of the alcoran was, to unite the profeſſors of the three different religions then followed in the populous country of Arabia, who, for the moſt part, lived promiſcuouſly, and wandered without guides, the far greater number being Pagans, and the reſt Jews and Chriſtians. In order to perform this, Mahomet pretended to be the ambaſſador of God, who, after the repeated admonitions, promiſes, and threatenings of former ages, had ſent him to eſtabliſh the true religion upon earth by force of arms, and appointed him chief pontiff in ſpiritual, and ſupreme prince in temporal affairs.

The great doctrine of the alcoran is the unity of God; and to reſtore that fundamental principle of true religion, Mahomet pretended was the chief end of his miſſion. But there are many occaſional paſſages in it, relating to particular emergencies; for whenever any thing happened to perplex the falſe prophet, he always had recourſe to a new revelation: and hence there are ſeveral paſſages in the alcoran contradictory to one another. The Mahometan doctors, however, obviate any objection that might be raiſed on this ſubject, by ſaying, that God commanded ſeveral things in the alcoran, which for good reaſons were afterwards revoked and abrogated.

That Mahomet was really the chief contriver of the alcoran is beyond diſpute; though it is highly probable, that he had no ſmall aſſiſtance in his deſign from others; particularly from one Sergius, a Neſtorian monk, and a Jew named Abdallah Ebn Salâm. The Mahommedans however abſolutely deny that the alcoran was compoſed either by their prophet himſelf, or any other perſon; it being their general and orthodox belief, that it is not only of divine original, but even eternal and uncreated, remaining, as ſome of them expreſs it, in the very eſſence of God; that the firſt tranſcript has been from everlaſting by God's throne, written on a table of vaſt bigneſs; that a copy from this table, in one volume on paper, was, by the miniſtry of the angel Gabriel, ſent down to the loweſt heaven in the month of Ramadan, whence Gabriel revealed it by parcels, ſome at Mecca, and ſome at Medina, at different times during the ſpace of twenty years, as the exigency of affairs required; giving Mahomet, however, the ſatisfaction of ſeeing the whole once a year. They add, that this original copy was bound in ſilk, and adorned with gold and precious ſtones of paradiſe.

Hence it is eaſy to conceive, that this book is held in the higheſt eſteem and reverence among the Mahometans. They dare not ſo much as touch it without being legally purified. They read it with great attention and reſpect, never holding it below their girdles. They ſwear by it, conſult it on the moſt weighty occaſions, carry it with them to war, write ſentences of it in their banners, adorn it with gold and precious ſtones, and, knowingly, do not ſuffer it to be in the poſſeſſion of any of a different perſuaſion.

ALCOVE, among builders, ſignifies a receſs, or part of a chamber, ſeparated by an eſtrade, or partition of columns, and other correſponding ornaments, in which either a bed of ſtate is placed, or ſeats to entertain company.

ALDEBARAN, in aſtronomy, a ſtar of the firſt magnitude in the eye of Taurus, and in England is commonly called the bull's-eye; it is marked α by Bayer, and is the 87th in Mr. Flamſtead's catalogue. The place of this ſtar has been ſettled with great accuracy at the Royal Obſervatory at Greenwich, in the late Dr. Bradley's time, from obſervations of the ſun near the time of his paſſing the equinox. See the conſtellation or ſign Taurus, for his right Aſcenſion, Declination, Variation,

tion; &c. which has been determined from the mean of 2000 obſervations, and may be looked upon as one certain given point in the heavens, whereby aſtronomers may ſettle the theory of the planets, as well as navigators determine their longitude at ſea, by obſerving his diſtance from the Moon. See LONGITUDE.

ALDER, *Alnus*, in botany, a genus of trees that produces male and female flowers; the male are digeſted into a long cylindrical looſe katkin, and each contain four ſmall ſtamina; the female flowers, which are connected into a ſcaly head, are without petals, but have each an oval germen, on which are affixed two ſtyles, extended the length of the ſcales, crowned with a ſingle ſtigma: when the flower is decayed, the germen becomes an oval ſeed incloſed in the ſcale of the fruit. The ſort which is moſt common delights to grow in watery places, where few other trees will thrive; they are propagated by layers, or from branches cut about three feet long, and planted in February or March: this plant may alſo be raiſed from ſeeds. The alder is reckoned very proper to make hedges in moiſt places, and the wood is of great uſe to turners, &c. The different ſpecies of the alder are claſſed by Linnæus with the betula or birch. See the article BIRCH.

ALDER *bearing black berries*. See TRANGULA.

ALDERMAN, the ſecond degree of nobility among the Anglo-Saxons, and now the ſecond degree in cities or corporations; the mayor being the head, the alderman the next, and the common-council the third, or loweſt degree.

The word is derived from the Saxon earlderman; that is, a ſenior, or alderman, which, by degrees, came to ſtand for perſons of the greateſt diſtinction, becauſe ſuch were choſen to diſcharge the higheſt offices, being thoſe whoſe long experience rendered them moſt capable, and whoſe birth and fortune made them moſt conſpicuous; and as they were generally intruſted with the government of the counties, inſtead of ſaying the governor, it was ſaid the earlderman of ſuch a county; and by degrees this word came to ſignify the governor of a county, or city. While the heptarchy laſted, theſe officers were only during the king's pleaſure; at laſt they were for life, at leaſt for the moſt part. After the Danes were ſettled in England, the title of earlderman was changed into that of earl, and the Normans introduced that of count, which, though different in its original ſignification, meant however the ſame dignity.

At this time aldermen are aſſociates to the mayor, or civil magiſtrates of moſt of our municipal or corporate cities or towns, who form a kind of council, and regulate matters according to the policy of the place: ſometimes they alſo take cognizance of civil and criminal matters, but very rarely, and in particular caſes: their number is not limited, being in ſome places ſix, and others twenty-ſix, out of which are annually choſen the mayors, or chief magiſtrates, who, at the expiration of their mayoralty, devolve again into aldermen.

An alderman ought to be an inhabitant of the place, and reſident where he is choſe; and if he removes, he is incapable of doing his duty in the government of the place, for which he may be diſfranchiſed.

ALE, a fermented liquor obtained from an infuſion of malt, and differing only from beer in having a leſs proportion of hops.

There are various ſorts of ale known in England, particularly pale and brown; the former is brewed from malt ſlightly dried, and is eſteemed more viſcid than the latter, which is made from malt more highly dried or roaſted.

Medicated ALES, thoſe wherein medicinal herbs have been infuſed, or added during the fermentation.

Gill ALE is that in which the dried leaves of gill or ground-ivy have been infuſed. It is eſteemed abſterſive and vulnerary, and conſequently good in diſorders of the breaſt and obſtructions of the viſcera.

ALE-CONNER, an officer in London, who inſpects the meaſures uſed in public houſes.

There are four ale-conners, who are all choſen by the common-council of the city.

ALE-SILVER, a tax paid annually to the Lord-mayor of London, by all who ſell ale within the city.

ALEA, a ſurname given to Minerva by Aleus, king of Arcadia, who built a temple to that goddeſs in the city of Tegea, the capital of his kingdom. In that temple were preſerved the hide and tuſks of the wild boar Calydon.

ALECTO, one of the three furies of hell, the daughter of Acheron and Night. See FURIES.

The word is Greek, and ſignifies *envy*.

ALECTORIA, in natural hiſtory, a ſtone ſaid to be formed in the ſtomach, liver, or rather gall-bladder of old cocks; and to which the antients attributed many fabulous virtues.

The word is Greek, and derived from αλεκτρον, a cock.

ALECTROMANCIA, in antiquity, a ſpecies of divination performed by means of a cock, in the following manner: a circle being deſcribed on the ground, and divided into twenty-four equal portions, in each of which was written one of the letters of the alphabet, and a grain of wheat placed on each of the letters; this being finiſhed, a cock was turned looſe in the circle, and particular notice taken of the grains picked up by the bird; becauſe the letters under them being formed into a word, gave an anſwer to the queſtion.

The word is Greek, and compounded of αλεκτρον, a cock, and μαντεια, divination.

A-LEE, in navigation, when a ſhip leans over to one ſide more than the other, by the wind thwarting the line of her courſe, and preſſing upon her maſts and ſails, which act upon her hull with the power of a lever, the ſide preſſed down is called the lee-ſide: hence when the helm is moved cloſe to it, it is ſaid to be a-lee, or hard a-lee: the other ſide is then called the weather-ſide, and the helm being moved over to it, is ſaid to be hard a-weather.

ALEGAR, a kind of vinegar made of ale.

ALEMBIC, a chemical veſſel uſually made of glaſs, or copper, for condenſing the vapours that riſe in diſtillation; for the alembic is properly the head or upper part of the apparatus uſed in diſtilling; though it is often uſed to ſignify the whole. See the articles STILL, and DISTILLATION.

ALEPH, the name of the firſt letter in the Hebrew alphabet, from which the *alpha* of the Syrians and Greeks was formed.

The word properly ſignifies chief, prince, or thouſand. There are ſome of the Pſalms and other parts of ſcripture which begin with Aleph, and the other verſes of them are continued with the other letters of the alphabet. The modern Jews uſe their letters as cyphers. Aleph ſtands for one; Beth for two; Gimel for three, &c.

ALESANDERS, or ALEXANDERS, in botany, the Engliſh name of a plant that produces umbelliferous pentandrious flowers, with leaves reſembling ſmallage. It was formerly uſed in cookery, with the ſame intention as cellery; it is reckoned a balſamic, but at preſent is little uſed either in the ſhops or kitchen. There are different ſpecies of this plant, all claſſed by botaniſts under the general name SMYRNIUM.

ALEXANDRINE, the name of a kind of verſe, which conſiſts of twelve ſyllables. It was ſo called from a poem written in French, in this metre, ſtiled the Alexandriad. It was frequently made uſe of by our old poets, even in whole poems: Spenſer conſtantly ends every ſtanza of his Fairy Queen with one of theſe verſes. Dryden was of opinion, that it might be introduced with great propriety, at the cloſe of a ſentence, to give an air of ſolemnity and majeſty to the thought; and accordingly we frequently meet with it in his works. It is now very much diſuſed, which might be owing, in ſome meaſure, to the following cenſure paſſed upon it by Pope, in his Eſſay on Criticiſm:

Then, at the laſt, and only couplet, fraught
With ſome unmeaning thing they call a thought,
A needleſs *Alexandrine* ends the ſong,
That, like a wounded ſnake, drags its ſlow ſtrength along.

Our Alexandrine verſe anſwers exactly to the *Trimeter Iambic* of the ancients, as may be ſeen from the two following lines,

Quĭd ĭs tĕ fĕrt | tūmūltŭs ? eŭt | quĭd ōmnĭum. Hor.
And āll thĕ dāy | in dōing gōod, | and gōdly dēeds. *Spenſ.*

ALEXIPHARMICS, in medicine, are properly remedies for expelling or preventing the ill effects of poiſon: but ſome of the moderns having imagined that the animal ſpirits, in acute diſtempers, were affected by a malignant poiſon, the term has been underſtood to mean medicines adapted to expel this poiſon by the cutaneous pores, in the form of ſweat. In this ſenſe, alexipharmics are the ſame as ſudorifics.

The word is formed from the Greek, αλεξω, to expel, and φαρμακον, a poiſon.

ALEXITERIAL, among phyſicians, a term of much the ſame import with alexipharmic; though ſometimes uſed in a ſynonymous ſenſe with amulet.

ALFAQUES, among the Moors, the name generally uſed for their clergy, or thoſe who teach the Mahometan religion, in oppoſition to the Morabites, who anſwer to the Monks among the Chriſtians.

ALFET, in our old cuſtoms, denotes a cauldron full of boiling water, wherein an accuſed perſon, by way of trial or purgation, plunged his arm up to the elbow.

ALGA, in botany, a genus of ſubmarine plants, called in Engliſh glaſs-wreck, compoſed of long ſlender leaves of a duſky-green colour, very much reſembling ſome kinds of graſs.

Authors enumerate ſeveral ſpecies of alga, the moſt conſiderable of which is the alga-marina, the ſalt of which is ſo much uſed in the glaſs trade.

ALGAROT, or ALGARET, in chemiſtry, an emetic powder prepared from regulus of antimony.

ALGEBRA, an univerſal arithmetic, or general method of computation by certain ſigns, ſimbols, or characters; or the method of ſolving problems and raiſing theorems by means of equations.

The word *algebra* is certainly derived from the *Arabic*, but there have been ſome miſtakes as to its meaning. When it was firſt introduced in Europe, it was underſtood to be the invention of the famous philoſopher Geber; and by ſome authors is ſometimes called *regula algebræ*, and ſometimes *regula Gebri*, which ſignifies nothing more than Geber's rule. But ſince the Arabic language has become more familiar in thoſe parts, it is well known that the Arabians called this art *al-gjabr w'almokábala*, which is literally the art of reſolution and equation; from hence we may infer, that the true derivation of the word algebra, is from the Arabic name of the art, and not from the ſuppoſed

inventor

inventor Geber. Whether the Oriental philoſophers or the Greeks were the firſt inventors of algebra, is yet diſputed; but it is very certain, that it was handed to us by the Moors, who had it from the Arabians; but whether they are indebted to the Perſians and Indians, or to the Greeks, is yet a diſpute. However, it muſt be allowed that the algebra taught us by the Arabians differs very much from that contained in the works of Diophantus, the oldeſt Greek author on this art which is now extant. But all theſe difficulties, which have given great men ſo much trouble, may be eaſily ſurmounted, if we ſuppoſe that the invention was originally taken from the Greeks, and new-modelled by the Arabians in the ſame manner as we know common arithmetic was: for this, which is extremely probable, makes the whole plain and clear, and leaves us the liberty to purſue the progreſs of this art; which, when it became better known to the Europeans, received different names. The Italians ſtiled it *ars magno*, which in their own language is *l'arte magjore*, oppoſing to it common arithmetic as the common or leſſer art. It was alſo called *Regula Coſæ*, the Rule of Coſs; becauſe the Italians make uſe of the word *Coſa*, to ſignify what we call root, and from thence this kind of learning being derived from them to us, the root, the ſquare, and the cube, were called Coſſic numbers, and this ſcience the Rule of Coſs.

Lucas de Burgo Sancti Sepuchri publiſhed at Venice, under the title of, *A compleat treatiſe of arithmetic and geometry, proportions and equations*, the firſt book which is now extant on this ſubject. It was printed ſo early as 1494, and is a very correct treatiſe: he aſcribes the invention of algebra to the Arabians, uſes their method, and treats very clearly of quadratic equations.

After him ſeveral authors in Germany and Italy wrote on the ſame ſubject; but ſtill the art advanced very little, till the famous Jerom Cardan printed at Nuremberg, in 1545, in folio, a treatiſe with this title, *Artis magnæ ſive de regulis algebraicis, liber unus*; and ſoon after a ſmaller piece, with the title of *Sermo de plus & minus*, wherein were rules contained for reſolving cubic equations, which have ſince been called Cardan's rules, tho' they were not invented by him, but as himſelf owns, by Scipio Ferreus of Bononia and Tartagila. The next celebrated writer was a French monk, whoſe name was Boteon, better known to the learned by the Latin appellation of Buteo. He publiſhed in 1559, his *Logiſtica*, in which there was a treatiſe of algebra, which gained him great reputation: yet his excellency lay in a clear and copious manner of writing; nor does it appear that he added any thing to what had already been diſcovered, except ſome corrections as to Tartagila's method of managing cubic equations.——Hitherto nothing was known of the Greek Analyſis; but in 1575, Xilander publiſhed Diophantus, or at leaſt a part of his works, which are ſtill remaining, and this quickly changed the face of things; for it preſently appeared, that his was a neater and more eaſy method, and withal opened a path to much greater diſcoveries, which was the reaſon that the ſucceeding algebraiſts quitted the terms made uſe of by Arabic writers, and adopted his. The time which Diophantus flouriſhed is not thoroughly ſettled. Voſſius thinks he lived in the ſecond century, but others place him in the fourth; his works were known to the Arabians, and tranſlated by them; nay it is ſaid, they have ſtill thoſe ſeven books of arithmetic of his which are loſt to us. The famous Arabian hiſtorian Abul-Pharaijus, whoſe works were publiſhed by the learned Pocock, not only mentions him, but aſcribes to him the invention of algebra; but in this he is to be underſtood as writing according to the lights he had; for though it be true that Diophantus Alexandrinus is the oldeſt author we have which treats expreſly of the analytic art, yet the footſteps thereof are viſible in much older writers. Theo, who is thought to have explained the five firſt propoſitions in the thirteenth book of Euclid in the analytic way, gives the honour of the invention to Plato, and indeed it ſeems very agreeable to his genius and method of reaſoning on mathematical ſubjects. By the junction of both lights, and a proper connection of the Arabic method of inveſtigation with the Greek terms, which were much ſhorter and eaſier, algebra quickly became a much more uſeful as well as conſiderable ſcience than it was before.——In our own country, the firſt writer on algebra that was known of, was Dr. Robert Record, a phyſician, who diſtinguiſhed himſelf in the reign of queen Mary, by his ſkill in the mathematics. He firſt publiſhed a book of arithmetic, which continued the ſtandard for that branch of learning for many years; and in 1557 he ſent abroad a ſecond part, under the title of *Cos ingenii*, or the *Whetſtone of wit*, which is a treatiſe of algebra; the word *cos* alluding to Coſſic numbers, or the Rule of Cos, by which name, as has been before ſhewn, this art was known. This treatiſe is really a great curioſity, conſidering the time in which it was publiſhed, and, together with his other works, muſt give us a high idea of the man's induſtry and application.

But notwithſtanding the early publication of this piece, and that ſome Engliſh gentlemen in their travels acquired ſome knowledge of this kind, as appears by a Spaniſh treatiſe of algebra, publiſhed by Pedro Nunnez, in 1567, yet it continued to be ſo little cultivated in England, that John Dee, in his mathematical preface, prefixed to Sir Henry Billingſley's tranſlation of Euclid, printed at London in 1570, ſpeaks of it in very high terms, and as a myſtery ſcarce heard of by the ſtudious in the mathe-

mathematics here: however, it is plain from ſome of his annotations on Euclid, that he was tolerably verſed therein, and was even acquainted with the manner of applying it to geometry. In 1579, Leonard Digges, a great mathematician for thoſe times, printed a treatiſe of algebra in his *Stratioticos*, after which it came to be better known, and more ſtudied, to which contributed not a little the improvements made by the author we ſhall next mention,

Franciſcus Vieta, who for his attachment to the mathematics, and eſpecially this part of it, is well known.

About the year 1590, he publiſhed a treatiſe of algebra in quite a new method; and by a judicious mixture of the Greek and Arabian rules, with ſome improvements of his own, introduced the mode of calculation which is ſtill in uſe under the title of *Specious Arithmetic*. Before this time, only unknown quantities were marked by letters, but ſuch as were known were ſet down in figures, according to the uſual notation. He made uſe of letters for both, only with this diſtinction, that the known quantities he repreſented by conſonants, and the unknown by vowels.——By this contrivance he greatly extended the ſcience, and, which was more, ſhewed its capacity of being farther extended: for, whereas former algebraiſts had confined their inveſtigations to the particular queſtions propoſed to them, he by this means produced theorems capable of reſolving all demands of a like nature, inſtead of particular ſolutions.—The learned Dr. Wallis has accounted very clearly for the new title that Vieta gave to his algebra.

The Romans had a method of ſtating law queſtions under general names, ſuch as Titius and Sempronius, Caius and Mævius, whence we derive our way of uſing A B C D on ſuch occaſions, which methods of ſtating the civilians ſtile *ſpecies*, in oppoſition to the ſtating of real caſes by true names.

Vieta having made a change of the ſame nature in algebra, and being a lawyer by profeſſion, he borrowed from that ſcience the title of his new invention, which was received with univerſal applauſe: we have likewiſe many of his works under the name of Apollonius Gallus, which he aſſumed on account of his firſt attempting to reſtore the works of Apollonius Pergæus. — About the ſame time flouriſhed Raphael Bombelli, an Italian, who publiſhed at Florence a treatiſe of algebra, wherein he firſt taught how to reduce a biquadratic equation to two quadratics, by the help of a cubic.—Our own countryman, Mr. William Oughtred, was the next great improver of algebra. Building however on what Vieta had already performed, he introduced ſuch a conciſeneſs, and withal ſo plain and perſpicuous a method of inveſtigating geometrical problems, as acquired him immortal reputation. His *Clavis Mathematicus*, or Key of the Mathematics, was firſt publiſhed in 1631, and is perhaps the cloſeſt, and moſt compendious ſyſtem hitherto extant.

In this work he contented himſelf with the ſolution of quadratic equations, reſerving thoſe of a higher power for another work, which was the *Exegeſis Numeroſa*, which in later editions is joined to his *Clavis*.

In both pieces there were abundance of additions and improvements, and the doctrine of proportions more fully and clearly ſtated than it hitherto had been; but the greateſt excellency of Mr. Oughtred's book was the application of the analytic method to geometry, which he did in a variety of caſes, and enabled his diſciples to proceed ſtill farther than he had done.——Cotemporary with him was Mr. Thomas Harriot, an excellent mathematician, and who made ſtill greater improvements in this ſcience. He is placed after Oughtred, though he died long before him, becauſe his book was not publiſhed till ſome time after the firſt edition of Oughtred's *Clavis*. It was then printed in a thin folio, by the care of Mr. Walter Warner, under the title of, *Artis analyticæ praxis ad æquationes algebraicas, nova, expeditâ & generali methodo, reſolvendas, tractatus poſthumus, &c.* that is, A treatiſe of the analytic art, containing a new, expeditious, and general method of reſolving equations; a poſthumous tract, by the late learned Mr. Thomas Harriot. The publiſher Mr. Warner prefixed a preface of his own, containing a very judicious, though conciſe, repreſentation of the ſeveral parts of algebra, their nature and dependence on each other, the extent and uſefulneſs of this art, and the progreſs thereof to this time. In Mr. Harriot's book, algebra takes a new form, and from him alone it met with more improvements than it had done from all who had ſtudied, or at leaſt all who had written upon it before him. ——It is divided into two parts, and the author begins his improvement by removing every thing that was uſeleſs, ſuperfluous, or inelegant in other methods: thus, inſtead of capitals, he introduced ſmall letters; inſtead of the terms ſquares, cubes, ſurſolids, &c. and their contractions, he brought in the powers themſelves, which made the operations much more eaſy, natural, and perſpicuous, than they were before. Having thus eſtabliſhed a plain and accurate notation, he proceeds to a multitude of new diſcoveries, of which, to the number of twenty-three, the reader may find a full, diſtinct, and very judicious account, in the celebrated treatiſe of Dr. Wallis.

From this admirable piece of Mr. Harriot's, Des Cartes took all the improvements he pretended to make, as the Doctor juſtly obſerves, and of which

which we ſhall furniſh the reader with ſome conciſe, and we think concluſive proofs. Firſt, It appears from the accounts we have of the life of Des Cartes, that he was here in England when Harriot's book was publiſhed, which being written in Latin, in a branch of learning about which that great man was then very ſedulous, it is eaſy to conceive that he was one of his firſt peruſers: Secondly, It is certain that he did not publiſh any thing on the ſubject before that year: Thirdly, His treatiſe of geometry, wherein theſe new improvements firſt appeared, was printed in French in 1637, without his name; which, in all probability, was to try what opinion the world would have of them, and whether any one of the French mathematicians could diſcern whence they were taken: Fourthly, Though he ſuffered the two firſt parts of his book to be publiſhed in Latin, with his name, in 1644; yet the third part relating to geometry, did not appear till 1649, when it was publiſhed by Francis Van Schooten. Theſe are probable reaſons only: but then, Fifthly, He follows Harriot diſtinctly in nineteen ſeveral diſcoveries; which, that they ſhould be made in the ſame method and manner, (except a few miſtakes) without conſulting Mr. Harriot, is altogether incredible, and was ſo held to be even by his own countrymen, when, through the information of the honourable Mr. Cavendiſh, they were made acquainted with Mr. Harriot's book: Sixthly, There are ſome little changes, particularly in the marks made uſe of by Des Cartes, and which were never followed by any body, that plainly intimate he only introduced them in order to diſguiſe: Seventhly, It appears that Des Cartes himſelf was acquainted with the charge brought againſt him on this head, and yet he never thought fit to juſtify himſelf, nor ever ſo much as declared, that he never had ſeen the book he was ſaid to have copied.

On the whole, therefore, there is all the reaſon in the world to believe, that the honour due to the great improvement of this ſcience, which fitted it for all that it has received ſince from foreigners or Engliſhmen, belongs to our author Harriot, and not to Des Cartes, who only accommodated theſe diſcoveries to geometrical ſubjects.

After him Dr. John Pell publiſhed ſome new diſcoveries, while he was reſident for the commonwealth of England in Switzerland. The method he took of doing it was this; he recommended to Mr. Thomas Brancker a Treatiſe of Algebra, written in the German language by Rhonius, which when he had tranſlated, the Doctor reviſed, altered, and added to it. In this piece there are a great many curious things, relating eſpecially to Diophantine algebra, but delivered very obſcurely, inſomuch that Dr. Wallis ſeems to be in a doubt, whether himſelf had reached Dr. Pell's true meaning. Yet to this gentleman, who wrote in ſo perplexed a way, we ſtand indebted for the invention of the regiſter; a method of great uſe, eſpecially to beginners, the practice of which chiefly recommended Kerſey's Algebra. As for the rules of John Van Hudde, Mr. Merry, Eraſmus Bartholine, Mr. Huygens, and others, we ſhall not take notice of them, becauſe, in reality, they are no more than improvements and deductions from Harriot. The ſame thing may be ſaid of what has been written by Meſſeurs Fermat, De Billy, Fernicle, and other French mathematicians, who only propoſed problems for other people to reſolve, and reſerved their own method of ſolutions as impenetrable ſecrets. Dr. Wallis has made ſome conſiderable improvements in this ſcience; eſpecially in reſpect to impoſſible roots in ſuperior equations; and what he left unperfect has been ſupplied by the ingenious Mr. Abraham de Moivre, whoſe accurate performances on that ſubject have lately been publiſhed in the Algebra of Dr. Saunderſon.

In 1655, Dr. Wallis publiſhed his *Arithmetica Infinitorum*, in which he ſquared a ſeries of curves, and ſhewed, that if this ſeries could be interpolated in the middle ſpaces, the interpolation would give the quadrature of the circle.

This treatiſe fell into the hands of the ingenious Sir Iſaac, then Mr. Newton, in the year 1664, when that gentleman was about twenty-two years of age; and he, by a ſagacity peculiar to himſelf, derived from this hint his celebrated method of infinite or converging ſeries. In 1665, he computed the area of the hyperbola by this ſeries, to 52 figures; which having communicated to Dr. Barrow, he prevented Mr. Nicholas Mercator's running away with the reputation of this diſcovery, who in 1668 publiſhed the quadrature of the hyperbola by an infinite ſeries. This was received with univerſal applauſe; and yet Mr. Newton far exceeded him, ſince, without ſtopping at the hyperbola, he extended this method by general forms to all ſorts of curves, even ſuch as are mechanical, to their quadratures, rectifications, and centers of gravity, to the ſolids formed by their rotations, and to the ſuperficies of thoſe ſolids; ſo that ſuppoſing their determinations to be poſſible, this ſeries ſtopped at a certain point, or at leaſt their ſums were given by ſtated rules. But if the abſolute determinations were impoſſible, they could yet be infinitely approximated, as he likewiſe ſhewed; and which, as a French writer juſtly obſerves, is the happieſt and moſt refined contrivance for ſupplying the defects of human knowledge, that man's imagination could poſſibly invent. It is alſo certain, that he attained his invention of fluxions by the time he was four and twenty; but his modeſty was ſo great, that he forbore to publiſh his diſcovery; which was the ſole reaſon that the honour of it was ever diſputed with him. In

1707, he firſt publiſhed a ſyſtem of algebra, under the title of Univerſal Arithmetic; and in 1722, gave another edition of it, wherein are contained all his improvements in that art. From the rules laid down by him, ſtill farther lights were ſtruck out by ſucceeding mathematicians, ſuch as Dr. Edmund Halley, who publiſhed in the Philoſophical Tranſactions a method of finding the roots of equations without any previous reduction, and the conſtruction of equations to the third and fourth power, by the help of the circle and parabola. Mr. John Colſon, who obliged the world with an univerſal reſolution, geometrical and mechanical, of cubic and biquadratic equations; Mr. Colin Mac Laurin in his treatiſe of Impoſſible Roots; Mr. Simpſon of Woolwich, Mr. Clark, and ſome others, have applied algebra likewiſe to the laws of chance and gaming, as may be ſeen in the excellent treatiſes they have written on that ſubject.

Numeral ALGEBRA is that wherein the unknown quantities are repreſented by letters, or ſymbols, and the known quantities by numbers.

This kind of algebra is what was uſed by the ancients, till the time of Franciſcus Vieta, (who was the firſt that invented literal or ſpecious algebra) and is ſometimes now uſed by young ſtudents in the ſcience, who cannot without ſome difficulty and practice make themſelves familiar with the algebraic language; and therefore, by this mixture of numbers and letters, they gradually become acquainted with the true value of letters, which may repreſent either known or unknown quantities.

Literal or *Specious* ALGEBRA, is that wherein both the known and unknown quantities are repreſented by letters or ſymbols, by which means we have general ſolutions inſtead of particular ones, as well as raiſe theorems, and demonſtrate all kind of problems, whether arithmetical or geometrical.

For the method of working the ſeveral rules in algebra, they will be treated of under their reſpective articles. See ADDITION, SUBTRACTION, MULTIPLICATION, DIVISION, &c.

ALGEBRAICAL, any thing that belongs or relates to algebra; thus we ſay, algebraic curves, ſolutions, characters, ſymbols, &c. See CURVE, &c.

ALGEBRAIST, one who underſtands and is well acquainted with algebra.

ALGENEB, a ſtar of the 3d magnitude, on the right ſide of Perſeus. It is the 33d in that conſtellation, according to Flamſtead's order, and marked α by Bayer. This ſtar, by moſt aſtronomers, is ſaid to be of the ſecond magnitude, but by obſervation, it is found to be only of the third. For its right aſcenſion, declination, &c. ſee the conſtellation PERSEUS.

ALGOIDES, a name uſed by Vaillant for a genus of plants, called, by Linnæus, zannichellia. See ZANNICHELLIA.

ALGOL, a fixed ſtar of the 3d magnitude, called alſo Meduſa's head; it is the 26th of Perſeus, according to Flamſtead's order, and marked β by Bayer. See the conſtellation PERSEUS.

ALGORAB, in aſtronomy, a ſtar of the 3d magnitude, in the right wing of Corvi; it is the 7th according to Flamſtead's order, and marked δ by Bayer. See the conſtellation CORVUS.

ALGORITHM, ſometimes called *logiſtica numeralis*, is an Arabic term frequently uſed to ſignify the practical rules in algebra, but more commonly, the five principal rules in arithmetic, namely numeration, addition, ſubtraction, multiplication, and diviſion.

ALGUAZIL, in the Spaniſh police, an officer whoſe buſineſs it is to carry the decrees of the judges into execution.

ALHEAL, in botany. See PANAX.

ALHIDADE, or ALIDADE, an Arabic name for a label, index, ruler, &c. which is moveable about the center of any arch; eſpecially in mathematical inſtruments, uſed in taking heights and diſtances. Theſe alidades are of different kinds; thus the plumb-line of a Gunter's quadrant, the index of a Hadley's quadrant, and the eight feet refracting teleſcope on the mural arch at Greenwich, &c. are what the Arabian writers of mathematics called alidades; but it is a term ſeldom made uſe of at preſent.

ALIAS, a ſecond or further writ iſſued from the courts of Weſtminſter, after a capias, &c. ſued out without effect.

ALIBI, in law, implies the abſence of the accuſed party; or his being at a diſtance from the place where the fact was committed, at the very time mentioned in the indictment.

The word is Latin, and properly ſignifies elſewhere.

ALIEN, in law, implies a perſon born in a ſtrange country, not within the king's allegiance, in contra-diſtinction to a denizen, or natural ſubject.

The word is formed from the Latin, *alius*, another; q.d. one born in another country.

An alien is incapable of inheriting lands in England, till naturalized by an act of parliament. No alien is entitled to vote at the election of members of parliament; nor can he enjoy any office, or be returned on any jury, unleſs where an alien is party in a cauſe, when the inqueſt is compoſed of an equal number of denizens and aliens.

Some have thought that the laws againſt aliens were introduced in the time of Henry II. when a law was made at the parliament of Wallingford, for the expulſion of ſtrangers, in order to drive away the Flemings and Picards, introduced into the kingdom by the wars of king Stephen. Others have

have thought that the original of this law was more ancient; and that it is an original branch of the feudal law; for by that law no man can purchaſe any lands, but he muſt be obliged to do fealty to the lords of whom the lands are holden; ſo that an alien that owned a previous faith to another prince, could not take an oath of fidelity in another ſovereign's dominions.

ALIEN-DUTY, an impoſt laid on all goods imported by aliens, over and above the duty for ſuch goods imported by Britiſh ſubjects, and on Britiſh bottoms.

ALIEN-PRIORIES, a kind of inferior monaſteries, formerly very numerous in England, and ſo called from their belonging to foreign abbies.

ALIENATION, in law, implies the act of making over a perſon's property in lands, tenements, &c. to another.

ALIFORMIS, in anatomy, the name of a pair of muſcles ariſing from the pterygoide bones, the proceſs of the os cuneiforme, with a beginning partly nervous, and partly fleſhy, and ending in the neck of the lower jaw.

ALIFORMIS PROCESSUS, a name ſometimes given to the prominence of the os cuneiforme.

ALIMENT, in a general ſenſe, implies whatever contributes to the nouriſhment of an animal or vegetable body.

ALIMENT, among phyſicians, whatever is capable of nouriſhing an animal body.

The loſs we ſuſtain daily makes it neceſſary that it ſhould be repaired by ſubſtances analogous to thoſe of our body, ſuch as aliment and drink, the ſtimulus to which is hunger and thirſt.

Experience has ſufficiently demonſtrated, that the beſt method of preſerving health is to live upon plain ſimple aliment, lightly ſeaſoned, and in quantity agreeable to the age, ſtrength of the ſtomach, ſeaſon of the year, ſex, conſtitution, and chiefly to what nature has found by experience to require: for it is as great a fault to take too much as too little. Perfect digeſtion is the beſt rule for regulating a meal, eſpecially if the perſon is more briſk and lively after a repaſt than before.

We have examples of many perſons, who by their temperance have lived to a very advanced age; wherefore, thoſe that are fond of life and health ſhould imitate their regimen. Exceſſes in eating and drinking are extremely pernicious.

Perſons of a delicate conſtitution, or who are juſt recovered from a diſeaſe, ſhould uſe ſoft light aliments agreeable to the ſtomach; for they make the beſt chyle.

Acid, tenacious, viſcous aliment, pies of all kinds, things that are fat, and of a blackiſh ſubſtance, are generally unfit for chylification, or render the chyle bad.

Strong, robuſt, young perſons, who uſe much exerciſe, ought to eat more than others; and may be more free with the groſſer kind of aliment; for their ſtomachs being ſtrong, the lighter kind of food would digeſt too eaſy, and be diſſipated too ſoon.

Children whoſe ſtomachs are weak, and veſſels fine, ought to uſe a light, ſlender, thin, ſoft aliment, eaſy of digeſtion; wherefore infants ſhould be fed with fluid milk, to avoid cauſing obſtructions in their fine and delicate veſſels. Conſequently, the milk of a nurſe newly brought to bed is more agreeable to infants, than that of one who has been delivered five or ſix months, and whoſe milk begins to have too great a conſiſtence. Nurſes ſhould obſerve an exact regimen, and ſhun all ſorts of violent paſſions; for they diſturb digeſtion, and communicate their bad effects to their children. When infants are weaned, they ſhould not be accuſtomed to ſpirituous liquors and ſtrong food, eſpecially the ſalt and ſmoke-dried, which are hard of digeſtion, and yield bad nouriſhment. The beſt method is to eat little at a time and often.

In old age the fluids are more thick, the ſecretions ſlow, and the ſolids more ſtiff than in youth; wherefore they require leſs food, and of a more ſoft, nouriſhing, moiſtening kind, eaſy of digeſtion, and not too much at a time, eſpecially in the evening.

At all times of life, but eſpecially in old age, the conſtant and immoderate uſe of ſalt and ſmoke-dried meat, acid and aromatic vegetables, as well as ſpirituous liquors, tend to harden and ſtiffen the parts of the body, inſtead of affording good nouriſhment; beſides, the digeſtion of theſe aliments is difficult, and render the blood ſo acrid, as to hurt the capillary veſſels.

However, an acquired habit is hard to be left off, and we find many perſons enjoy a good ſtate of health when their meat and drink are very indifferent, becauſe they are become cuſtomary, and they are apt to fall ſick when they attempt to change their manner of life; for cuſtom is a ſecond nature: all great changes ought to be brought about inſenſibly.

For this reaſon, it is good not to contract a habit of any kind; wherefore, perſons of a good conſtitution ſhould live in a various manner, and refuſe no kind of aliment; and ſhould ſometimes be in town, and ſometimes in the country; ſhould uſe much exerciſe, and ſhould even now and then exceed the exact bounds of moderation, and at other times omit a meal now and then.

Hunger ſhews the beſt time of eating, but cuſtom confines us to certain hours. Perſons who find no inconvenience from dining and ſupping every day, need not change their manner of life. In youth, wherein there is a great diſſipation, and in age, where ſtrength is wanting, and when little is eaten at a time, ſomething taken between meals

is not amiſs. However, it is neceſſary to obſerve, that when the ſtomach is bad, perſons ſhould not begin to eat again till the laſt meal is digeſted.

When a perſon is greatly fatigued, and his ſpirits diſſipated, it will be neceſſary to reſt before eating. In caſes of diſtreſs and ſorrow, the aliment ſhould be very light, and ſmall in quantity, becauſe the ſtomach is weak at thoſe times.

In the ſummer, when the ſpirits and fluid parts are apt to evaporate, the aliment ſhould be light, moiſt, fluid, and eaſy of digeſtion, to repair the loſs with greater ſpeed; whereas in winter the ſtomach will admit of groſſer food.

ALIMENTARY, an epithet applied to whatever belongs to aliment or food.

ALIMENTARY *Duct*, in anatomy, a name given by ſome to the inteſtines, on account of the aliments paſſing through them.

ALIMENTARY *Duct* is alſo ſometimes uſed for the thoracic duct. See THORACIC *Duct*.

ALIMONY in law, implies that allowance which a married woman ſues for, and is entitled to, upon any occaſional ſeparation from her huſband.

The word is Latin, *alimonia*, and properly ſignifies nouriſhment or maintenance.

ALIQUANT *Part*, in arithmetic, is a number that cannot meaſure a given number, or cannot divide a given number without leaving a remainder; thus, 5 is an aliquant part of 17; 4 of 9: 3 of 5, &c. but that theſe aliquant numbers cannot meaſure any numbers, (as is ſaid in ſome books of this kind) is abſurd, for 5 will meaſure 10, 15, 20, &c.

ALIQUOT *Parts*, in arithmetic, are ſuch as will meaſure or divide a given number, without any remainder; as 5 will divide 10, 20, 25, &c. 7 will divide 14, 21, 28, 35, &c. theſe therefore are called aliquot parts of the above numbers. The aliquot parts of a pound are the following:

10 *s.*	make one	half	of	20 *s.*
5	- -	fourth	- -	-
4	- -	fifth	- -	-
2	- -	tenth	- -	-
1	- -	twentieth	- -	-
6 *s* 8 *d.*	- -	third	- -	-
3 4	- -	ſixth	- -	-
2 6	- -	eighth	- -	-
1 8	- -	twelfth	- -	-
1 4	- -	fifteenth	- -	-
1 3	- -	ſixteenth	- -	-
0 10	- -	twenty-fourth	- -	
0 5	- -	a forty-eighth	- -	-

The rule for finding all the aliquot parts of any number, is, Divide the given number by its leaſt diviſor, and that quotient by its leaſt diviſor, until you get a quotient that is not diviſible, and you will have all the prime diviſors, or aliquot parts of that number; then if every two, three, four, &c. be multiplied into themſelves, the products will be the ſeveral conjoined diviſors, or aliquot parts of that number. For multiplication and diviſion of aliquot parts, ſee MULTIPLICATION and DIVISION *of Aliquot Parts*.

ALKAHEST, or ALCAHEST, among chemiſts, implies an univerſal ſolvent, or a menſtruum that will diſſolve all bodies without exception.

The word ſeems to have been coined by Paracelſus, it being derived from no language, and was unknown before the time of that author.

Paracelſus, and the elder Van Helmont, have expreſly declared in their writings, that there is a certain fluid in nature, capable of reducing all ſublunary bodies, as well homogeneous as mixed, into their ens primum, or original matter whereof they are compoſed; or into an uniform, equable, and potable liquor, that will unite with water, and the juices of our bodies, yet retain its ſeminal virtues; and if mixed with itſelf again, will thereby be converted into pure elementary water: whence they imagined this menſtruum could at length reduce all things to water, whilſt, itſelf, was incapable of any farther change. Such a declaration as this, ſeconded by the aſſeveration or oath of Helmont, who religiouſly ſwears himſelf poſſeſſed of the ſecret, cauſed all the ſucceeding chemiſts ſollicitouſly to turn their thoughts and labours to find out ſuch a noble menſtruum. And the famous Mr. Boyle was ſo fond of it, that he frankly acknowledges he had rather have been maſter thereof than of the philoſopher's ſtone; as indeed, it were a thing more to be wiſhed for than the power of tranſmuting metals. That great philoſopher, however, ingenuouſly tells us, he had not the good fortune to poſſeſs it.

Now it is eaſy to conceive, that all bodies might originally grow from ſome firſt matter, which was once in a fluid form. Thus the primitive matter of gold is, perhaps, nothing more than a ponderous fluid; which, from its own nature, or a ſtrong attraction between its parts, afterwards acquires a ſolid form. The aſſertion, therefore, of Paracelſus and Helmont carries a ſhew of probability with it, when they ſay there is ſome univerſal ens, or original matter, that reſolves all bodies into their ens genitale, or the primitive ſubſtance whereof they were at firſt created. So many are the authors who have treated of this ſubject, that a library might almoſt be collected of the books written upon the alkaheſt. Weiderfelt, in his treatiſe *De Secretis Adeptorum*, has made a collection of all the opinions that have been entertained about it; but it is manifeſt from his writings, that he himſelf never ſaw the thing. Pantaloon alſo, with Philalethes, Tachenius, Ludovicus, and a thouſand others, treat of the ſame ſubject. But none of them ſpeak to the purpoſe, nor declare themſelves poſſeſſed of the ſecret, except Paracelſus and Helmont, who are

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the original authors, and upon whose writings the rest have made idle comments, or fallen into some whimsical conceit as to this grand solvent.

But notwithstanding their pretensions, the principal chemists are now persuaded that no such solvent ever existed in nature: at least, that no mortal was ever possessed of the secret. This, indeed, seems sufficiently evident from the very nature of the alkahest; for if it will dissolve all bodies, it will be impossible to be kept in any vessel. Van Helmont therefore cannot be believed, when he asserts that he had a bottle filled with alkahest lent him; because it could not be contained in any bottle, as it would dissolve the vessel and be lost.

ALKALI. See the article ALCALI.

ALKANET, in botany, the English name of a genus of plants called anchusa. See ANCHUSA.

ALKEKENGI, the winter cherry, in botany, a plant with perennial roots, from which in the spring, the stalk arises to about a foot high, furnished with heart-shaped leaves standing in pairs; the flower produced from the wings of the stalk is monopetalous, divided at the extremity into five segments; in the center is placed a round germen, supporting a slender style, accompanied by five filaments, topped with oblong upright antheræ, which join together; this is succeeded by a globular berry, covered by an inflated empalement, containing a number of kidney-shaped seeds. The fruit ripens in autumn, and in colour and shape much like a cherry; if the season is mild, will continue to the latter end of the year, afterwards the plant dies to the ground.

The fruit of this plant is by some much celebrated for their lithontriptic qualities, and are said powerfully to cleanse the urinary passages of all gravel, and whatever is apt to obstruct them, and likewise by their detersive qualities, to be good in the jaundice, and other affections of the viscera. The berries boiled in milk, and sweetened with sugar, cure the heat of urine, the making bloody water, and ulcers in the kidneys or bladder.

There are various sorts of the alkekengi, which are all called by Linnæus physalis.

ALKERMES, a compound cordial medicine, formerly much in use, the principal ingredient of which is kermes. See KERMES.

ALKORAN. See ALCORAN.

ALLA, or ALLAH, the name of God among the professors of the Mahometan religion. It properly signifies the adorable Being.

The word is Arabic, and derived from *alah*, to adore.

ALLANTOIS, or ALLANTOIDES, in anatomy, a vesicle investing the fœtus of several animals, and containing an urinous liquor, supposed to be conveyed thither from the urachus.

The word is Greek, and compounded of ἀλλας, a gut, and εἶδος, resemblance.

Anatomists are not agreed whether the allantois has or has not any existence in the human species.

ALLAY. See the article ALLOY.

ALLEGATION, in law, implies the producing instruments, or deeds, for proving the truth of something litigated before the court.

ALLEGIANCE, in law, signifies the obedience which every subject owes to his lawful sovereign.

The word is formed from the Latin *allegiantia*, and derived from *allego*, to admit.

Allegiance is either natural, acquired, or local.

Natural ALLEGIANCE is that which every subject born ought to pay immediately upon his birth.

Acquired ALLEGIANCE is that which a person naturalized, or made a denizen, owes to the king.

Local ALLEGIANCE is that which a person, on his entering the dominions of another prince, ought to pay for his protection.

Oath of ALLEGIANCE is that taken by the subject, and in which he acknowledges the king a temporal prince.

ALLEGORICAL, something belonging to, or partaking of, the nature of an allegory. See ALLEGORY.

ALLEGORICAL *Poetry* is that where some useful moral is conveyed under the veil of fiction and allegory. The most beautiful poem of this kind in ours, or perhaps in any other language, is Spenser's Fairy Queen.

This species of poetry allows the largest scope and latitude to the genius: the fancy of the poet, winged with the wildest enthusiasm, may fly out beyond the bounds of space and time; it may *give to airy nothing a local habitation and a name*. Not contented with *bodying forth* the virtues, vices, passions, and all natural and moral qualities; it may dart into the fairy-land of fiction; and with more than magic power conjure up a new creation of monstrous dragons, enchanted castles, and tremendous giants. Yet *rolling in this fine frenzy* the eye of the poet must still watch the moral: however wild and romantic his inventions are, the mystical meaning of his fable must appear under the veil distinct and intelligible. It is this, and this only, which can justify him, when he transports us, beyond the bounds of nature, into that ideal country, whose inhabitants are all apparitions, whose very rocks have voice and language, and whose trees drop tears of blood.

Having thus given the reader a short sketch of the general meaning of allegorical poetry, it may not be amiss to mention four qualifications, which appear to be necessary to this sort of composition.

The first is, that the fable must be lively and surprizing, in order to raise and engage our curiosity.

curiosity. As there is more invention therefore employed in a work of this kind than in mere narration, or description, or indeed than in general amplifications on any subject whatever, it consequently requires a more than ordinary heat of fancy, when the subject is first struck off the anvil. If the fable is flat, spiritless, and uninteresting, the reader's imagination is not affected, nor his attention engaged, though the instruction conveyed under it be ever so useful or important.

The second qualification is a beautiful propriety or aptness in the fable to the subject on which it is employed. The invention of the poet should never lose itself in a confusion of ill-sorted ideas, nor, aiming only to surprize the imagination, offend the judgment. As it requires a heat of fancy to raise images or resemblances; so it requires a good taste to distinguish and range them, and to chuse the most proper and beautiful, where there appears an almost distracting variety.

Another essential property is, that the fable be every where consistent with itself. As licentious as allegorical poetry may seem in some respects, it is nevertheless subject to this restraint. The poet is indeed at liberty in chusing his story, and inventing his persons; but after he has introduced them, he is obliged to sustain them in their proper characters. *Sibi constent*, is a rule that ought never to be violated: for however extravagant his characters may be, they should never be absurd.

The three qualifications mentioned above, respect the fable of the poem; the last property relates to the moral, and is, that the allegory should be clear and intelligible; for the fable is designed only to clothe and adorn the moral, not to hide it. The poet should in this respect imitate the art and skill which is shewn by the old and celebrated masters of statuary; who in composing an animated figure, considered the situation of every limb, muscle, and vein, which they finished with the utmost exactness; and then afterwards put on the drapery in such an easy and natural manner, that instead of hiding, it contributed to discover the beautiful symmetry of the parts over which it was thrown.

ALLEGORIST, one who writes in, or has recourse to allegories.

ALLEGORY, is the name given to a fable or story, in which, under imaginary persons or things, is shadowed some real action, or instructive moral: it is, according to Plutarch's definition, that in which one thing is related, and another understood. Every allegory therefore must be considered as having two meanings, the literal and the mystical: the literal sense is like a dream or vision, of which the mystical sense is the true interpretation.

If we pursue this point still further, we shall find, that as a simile is nothing but a continued metaphor, so an allegory is only a continued simile. It may not be amiss to illustrate this by an example: "The *helm* of state was under the "management of Cato." This is simply a metaphorical expression, by which the state is in one word compared to a ship: if we say further that, "As the wary pilot steers the ship secure from all "the rocks and shelves, that lie in wait to destroy "it; so Cato preserved the state from every in-"trigue and plot that threatened its destruction;" we then continue the metaphor into a simile; which if pursued still further will become an allegory, as we see in that excellent ode of Horace,

O navis referent in mare te novi
Fluctus!

We meet with nothing in the whole ode, that is not strictly applicable to a ship; and yet it is universally agreed, that the thing signified is the Roman state. Considered in this light, tides and tempests are wars and civil broils; the port is peace and concord; the sails are the laws; the magistrates are the mariners; and the rocks and shallows are those dissentions that may tear and distract it.

The more immediate uses of allegory seem to be these; to render Virtue more amiable, by cloathing her in the gay and ornamental robes of Fiction, and Truth more engaging, by making her fly from before us, and raising a strong curiosity in us to pursue and overtake her. The Virtues, in allegory, are personified, and employed in great and interesting adventures; they present themselves to us in the most alluring manner, adorned not only in native loveliness, but in all the graces of action; we are charmed with their beauty, and cannot help interesting ourselves in their welfare; they enlist the passions on their side, and we follow them through all their difficulties, till at last they arrive at the end that was proposed, and are crowned with success. It does not signify that we know it is all a fiction; we enter willingly into the deceit, when an air of probability runs through the story, and event follows event in a regular and natural succession. Rules of morality are dull and uninteresting; they may indeed instruct, but seldom entertain us: nay, even truth itself is more engaging when pursued, than when possessed; like eager sportsmen we follow the chace with unwearied pleasure, but when once the game is hunted down, we trouble ourselves little further about it. It was for this reason that *parables* are frequently interspersed in the New as well as Old Testament. Composed of probable, yet at the same time of fictitious events, they raise our curiosity, and engage our imagination; by which means the moral that they are intended to convey, steals upon us imperceptibly, and we find either our hearts improved, or our understandings enlightened. When Nathan the Prophet was sent

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to reprove David for the murder of Uriah, and his adultery with Bathsheba; we cannot help admiring the art and address with which he executed his commission. He did not attack the king with old canting saws and lessons of morality; did not expatiate on the heinousness of the crimes which he had committed, and the necessity there was for a hearty and sincere repentance: no; he took a more effectual method, by concealing his design under the veil of an allegory or parable. He began a simple and pathetic story, that awakened the attention and curiosity of the king; he touched the secret springs and movements of his soul; called up on one hand his tenderness and pity, and on the other his anger and indignation: "As the Lord liveth, said David, the man that "hath done this thing shall surely die!" Before he was convicted, he was self-condemned; and when Nathan retorted upon him, "Thou art the "man," could not fail of being overwhelmed with remorse and confusion.

ALLEGRO, in music, an Italian word, signifying that the part is to be played in a brisk, gay, and sprightly manner.

ALLELUJAH is an expression of joy or praise, made use of in several parts of the holy scripture. It is compounded of the two Hebrew words, הללו *hallelu*, and דה *jah*, which is an abbreviation of יהוה *Jehovah*: its literal meaning is, *Praise the Lord.*

ALLERION, in heraldry, a sort of eagle, without beak or feet, having nothing perfect but the wings.

ALLEVEURE, a small brass Swedish coin, worth about 2¾ *d.* English.

ALLEY, in gardening, a straight walk bounded on both sides with trees or shrubs, and commonly covered with gravel or grass. An alley is distinguished from a path, by being broad enough to admit two persons to walk a-breast, whereas a path is supposed to admit of but one at a time; but if an alley is wider than ten or twelve feet, it may, with more propriety, be called a walk.

Covered ALLEY, is where the trees on each side meet at the top, so as to form a shade.

ALL-HEAL, in botany. See PANAX.

ALLIANCE, in the civil and canon law, implies the relation between two persons, or two families contracted by marriage.

ALLIANCE is also used to signify a treaty entered into by sovereign princes or states, for their mutual safety or defence.

Defensive ALLIANCE is that whereby the contracting parties engage to stand by and assist each other against any power that shall attack either.

Offensive ALLIANCE implies an agreement between powers, whereby they engage themselves to attack jointly some other prince or state.

ALLIGATION, in arithmetic, is that rule by which we resolve questions that concern the mixing or uniting divers simples or particulars into one mass or sum, according to any price or sum required.

The word is formed from the Latin, *alligare*, which signifies to tie together; perhaps from a sort of vincula or curve, commonly used to connect or join the several quantities or numbers together.

Alligation is either *medial* or *alternate*.

ALLIGATION *medial*, is, when having the several quantities and rates of divers simples proposed, we discover the rate of a mixture compounded of those simples. All questions in this may be solved by the following rule.

Having the quantity of the ingredients and the particular prices, to find the price of some part of the mixture.

RULE.

Multiply the ingredients severally by their own prices, and divide the sum of those products by the sum of the ingredients, and the quotient answers the question.

EXAMPLE.

A Tobacconist would mix 20 ℔. of tobacco, at 9 pence the pound, with 60 ℔. at 12 *d.* with 40 ℔. at 18 *d.* and with 12 ℔. at 2 *s.* the pound. Place the numbers of their value as follows:

℔.	*s. d.*		*£. s. d.*
20 at	0 9	per ℔. will cost	0 15 0
60 at	1 0	- - - - -	3 0 0
40 at	1 6	- - - - -	3 0 0
12 at	2 0	- - - - -	1 4 0
Sum simple 132		Total value	7 19 0

Therefore 7*l.* 19*s.* ÷ 132 = 1*s.* 2⅔*d.* = the value of one pound.

ALLIGATION *alternate*, is when the rates or qualities of divers simples are given, and the quantity of each is required, necessary to make a mixture of the given rate or quality; it likewise shews the proportion of several ingredients, and counterchanges the places of such excesses or differences as arise between the mean price and the extremes; ascribing that to the greater extreme which comes from the lesser, and contrarily. To resolve questions in alligation alternate, observe the following rules.

First, when the prices of the simples are expressed, but no quantity given, and it is required how much of each simple we must take to sell one quantity or measure at a mean rate propounded;

RULE.

Link the extremes together, and take the difference between each number and the mean rate pro-

pounded, and place that difference againſt its yoke-fellow, which will be the quantity required of that yoke-fellow in this mixture.

EXAMPLE.

A Merchant hath ſpices, ſome at 9 *d.* per pound, ſome at 12 *d.* ſome at 24 *d.* and ſome at 30 *d.* per pound; how much of each ſort muſt he take, that he may ſell a pound for 20 *d.*

Link the numbers together in the following manner:

d.

Price propoſed 20 *d.* { 9, 12 — 10 ; 24, 30 — 4 ; 8 ; 11

The difference between 9 and 20 = 11, which is placed againſt its yoke-fellow 30, which denotes that 11 pounds is to be taken off that at 30 *d.* per pound, to make the mixture: the difference between 12 and 20 is 8, which place againſt its yoke-fellow; likewiſe between 24 and 20 is 4, and 30 and 20 is 10, which place in their proper places, as in the example above, and the work is done; for the numbers 10, 4, 8, and 11, are the quantities of each required.

Note, That as many different ways as the numbers can be linked together, ſo many different anſwers will be given, and yet all true.

Second, when the price of all the ſimples, and the quantity of one is given, to find the quantity of all the reſt, ſo as one meaſure or quantity may bear a mean rate or price propounded.

RULE.

As the difference ſtanding againſt the quantity given:
To the reſt of the differences beſides : :
So is the quantity given :
To the quantity ſought: each to its reſpective difference.

EXAMPLE.

A Tobacconiſt hath 30 lb. of tobacco at 24 *d.* per pound, which he would mix with ſome at 12 *d.* per pound, ſome at 9 *d.* and ſome at 7 *d.* per pound; and he would know how much of each ſort of the ſaid leſs prices, muſt be mixed with the 30 lb. of the beſt, that he may ſell it at a penny the ounce, or for 16 *d.* per pound.

Firſt, ſet down the numbers, link them together, and take the differences, as in the laſt example. Thus,

24, 12	4, 7, 9,	20, 30
9	8	8
7	8	6
		8

Then ſay, As 20, the difference againſt the quantity given: to 8 the next difference : : ſo 30: to 12, the quantity required at 12 *d.* per pound. And ſeeing the other differences are equal, it will require 12 lb. of each.

Third, When the prices of each ſimple is given, and the mean rate or price, and it is required to find how much of each ſort muſt be taken, to make a certain quantity propounded, agreeable to the mean rate given.

RULE.

As the total ſum of the differences:
Is to the total quantity given : :
So is any particular difference:
To its particular quantity ſought.

EXAMPLE.

A Grocer hath four ſorts of currants, one at 4 *d.* the lb. one at 6 *d.* one at 9 *d.* and the beſt at 11 *d.* the lb; he would mix 240 lb. and to have ſo much of each ſort in this mixture, as to ſell a pound for 8 *d*; how much of each ſort muſt he take?

Place your numbers with the mean price, linking them, and take their difference as follows:

4, 6	3	72
9	1	24
11	2	34
	4	96
	10	240

Then ſay,

As 10 : 240 : : 3 : 72 the quantity at 4 *d.* per lb.
10 : 240 : : 1 : 24 D°. - - - 6 *d.* D°
10 : 240 : : 2 : 48 D° - - - 9 *d.* D°
10 : 240 : : 4 : 96 D° - - - 11 *d.* D°

ALLIGATOR, in natural hiſtory, an amphibious creature common in South-America, ſuppoſed by ſome authors to be the ſame with the crocodile found in Aſia and Africa. Its head is long, and ſlender towards the extremity, gradually forming a ſnout like that of a hog. Both the upper and lower jaws have a row of very ſtrong and pointed teeth.

ALLIOTH, in aſtronomy, a fixed ſtar of the ſecond magnitude, in the tail of the great bear. For its right aſcenſion, declination, &c. ſee the conſtellation URSA MAJOR.

ALLIUM, garlick, in botany. See GARLICK.

ALLOCATION, an allowance made upon account in the Exchequer.

ALLOCATIONE *Facienda*, a writ for allowing to an accountant ſuch ſums of money as he has lawfully expended in his office; directed to the lord-treaſurer, and barons of the Exchequer.

ALLOCATO *Comitatu*, a new writ of exigent allowed before any other county-court, held on the former not being fully ſerved or complied with.

ALLODIAL, an epithet applied to an inheritance held without paying any acknowledgment to either lord or ſuperior.

The word is formed from the Saxon, *a* privative, and *leof*, lord; *q. d.* held without a ſuperior.

Allodial lands are what we term free lands, which a perſon enjoys without paying any fine, rent, or ſervice.

ALLODIUM, free lands, or ſuch as are the abſolute property of their owner, without his being obliged to pay any acknowledgment whatſoever.

ALLOM. See the article ALUM.

ALL-SAINTS, a feſtival celebrated by the Chriſtian church on the firſt of November, in commemoration of all the ſaints in general.

ALL-SOULS, a Chriſtian feſtival kept on the ſecond of November, in commemoration of all the faithful deceaſed.

ALLOY, or ALLAY, a proportion of a baſer metal with one that is finer.

All gold coin has an alloy of ſilver, and ſilver coin an alloy of copper. A pound weight of ſtandard gold, by the preſent ſtandard of the mint, is two and twenty carats fine, and two carats alloy; and a pound weight of ſtandard ſilver conſiſts of eleven ounces two penny weights of fine ſilver, and eighteen penny weights of alloy. And in proportion as gold or ſilver has more or leſs alloy than that above-mentioned, it is ſaid to be coarſer or finer than the ſtandard.

ALLUMINOR, a perſon who colours or paints upon paper or parchment.

The word is derived from the French *allumer*, to lighten.

ALLUSION, in rhetoric, a figure by which ſomething is applied to, or underſtood of another, on account of ſome ſimilitude between them.

ALLUVION, among civilians, denotes the gradual increaſe of land along the ſea-ſhore, or on the banks of rivers.

ALMACANTERS, ALMACANTARAS, or ALMACANTARATHS, in aſtronomy, are circles of the ſphere parallel to the horizon, imagined to paſs through all the degrees of the meridian, and are the ſame thing with regard to the azimuths and horizon, that the parallels are with regard to the meridian and horizon.

ALMACANTER-*Staff*, an inſtrument formerly uſed at ſea to obſerve the ſun's amplitude; it was uſually made of wood, and had an arch containing 15 degrees.

This inſtrument is never uſed at preſent, as much better are introduced in its place.

ALMAGEST, an Arabic name for a celebrated book of Ptolomy's compoſing, being a collection of many curious obſervations and problems of the ancients in geometry and aſtronomy.

Ricciolus alſo publiſhed a body of aſtronomy, which, after Ptolomy, he called the New Almageſt, being a collection of the ancient and modern obſervations and diſcoveries in that ſcience.

ALMANAC, a book or ſheet of paper, uſually containing the months, the days of the month, the feſtivals, riſing and ſetting of the ſun and moon, length of days and nights, equation of time, high-water, and age of the moon, as well as the viſible and inviſible eclipſes of the ſun and moon.

Authors differ greatly both with regard to the inventor of almanacs, as well as the etymology of the word, ſome deriving it from *al* and *manah*, to count; while others think it comes from *almanah*, New-Years gifts, becauſe the Arabian aſtrologers made preſents of their ephemerides the firſt day in the year. For the method of conſtructing almanacs, See CALENDAR, EPHEMERIDES, &c.

Hereſy of ALMARIC, a tenet broached in France by one Almaric, in the year 1209. It conſiſted in affirming, that every Chriſtian was actually a member of Chriſt; and that without this faith no one could be ſaved.

His followers went farther, and affirmed, that the power of the Father laſted only during the continuance of the Moſaic law; that the coming of Chriſt introduced a new law; that at the end of this began the reign of the Holy Ghoſt; and that now confeſſion and the ſacraments were at an end, and that every one is to be ſaved by the internal operations of the Holy Spirit alone, without any external act of religion.

ALMENE, in commerce, a weight of two pounds, uſed in weighing ſaffron in ſeveral parts of the continent of the Eaſt-Indies.

ALMOND-TREE, *Amygdalus*, in botany, a genus of trees with roſaceous flowers, producing a large oval compreſſed fruit, which opened, diſcovers a nut containing a ſeed of the ſame form, the common almond-tree being cultivated in gardens more for ornament than uſe, it making a beautiful appearance early in the ſpring when few other trees are out. Every good ſhrubbery ſhould have a few of theſe plants interſperſed with the others: they are propagated by inoculation on plum ſuckers, or ſtocks of almonds raiſed from the ſeeds, and are to be met with in every nurſery garden.

ALMONDS, the fruit of the almond-tree. There are two kinds, bitter and ſweet, of which conſiderable quantities are imported from Spain, Italy, Turkey, and other places up the Mediterranean, and are much uſed in confectionary and medicine. The bitter almonds are reckoned aperient, deterſive and diuretic, they are therefore recommended in obſtructions of the liver, ſpleen, meſentery, &c. Their expreſſed oil is much uſed to ſoften and deterge the wax out of the ears when ſtopped up, and ſome uſe them as a ſubſtitute in making ratifia, they being more eaſily procured than apricot kernels.

Sweet Almonds are of a ſoft grateful taſte, and

are cooling, healing, and nutrimental: in the common medical practice they are much preſcribed in emulſions, and are good in all diſorders ariſing from choleric and acrimonious humours; they cool and cleanſe the kidneys, giving eaſe in cholic pains and all irritations of the bowels.—— The expreſſed oil, which is ſo frequently uſed, is a ſafe and good remedy in nephritic pains, and may be given in large quantities, for it not only blunts the ſharp points which irritate the membranes, but alſo relaxes the paſſages ſo as very much to favour the expulſion of all ſuch matter; it is alſo much in eſteem with nurſes for coſtiveneſs and the gripes in children, and is ſometimes uſed in glyſters.

ALMONDS, among lapidaries, ſignify pieces of rock-cryſtal, uſed in adorning branch-candleſticks, &c. on account of the reſemblance they bear to the fruit of that name.

ALMONER, an officer appointed to diſtribute alms to the poor.

Lord ALMONER, or *Lord-high* ALMONER *of England*, is an eccleſiaſtical officer, generally a biſhop, who has the forfeiture of all deodands, and the goods of felos de ſe, which he is to diſtribute among the poor.

He has alſo, by virtue of an ancient cuſtom, the power of giving the firſt diſh from the king's table to whatever poor perſon he pleaſes, or, inſtead of it, an alms in money.

ALMUCANTARS. See ALMACANTARS.

ALNAGE, or AULNAGE, the meaſuring of woollen manufactures with an ell.

It was at firſt intended as a proof of the goodneſs of the commodity, and accordingly a ſeal was invented as a mark that the commodity was made according to the ſtatute; but it being now poſſible to purchaſe theſe ſeals, they are affixed, whenever the vender pleaſes, to all cloths indiſcriminately, to the great prejudice of our woollen manufactures.

ALNAGER, a public officer, whoſe duty it is to examine into the aſſize of all woollen cloth, fix ſeals upon the various pieces, and collect the alnage-duty for the king.

ALNUS, in botany, the alder-tree. See ALDER-TREE.

ALOOF, at a diſtance. This is generally ſuppoſed to be a term of the marine, and thence to have been transferred into common diſcourſe; but this ſeems matter of doubt: the reaſon of this conjecture is probably the reſemblance of the phraſes, keep aloof, and keep the luff, which is the command of the officer who ſuperintends the ſhip's courſe to the man who ſteers, to direct her ſtem nearer the wind, or nearer that point of the compaſs from which the wind blows. If it was really a ſea phraſe, it appears to have regarded the dangers of a lee-ſhore, where the pilot might apply it in the ſenſe commonly underſtood, that is, "keep aloof," or keep off!

ALOE, in botany, a genus of plants producing liliaceous flowers, which are each deſtitute of an empalement, but are compoſed of a tubulous ſingle corolla, ſpread open and divided into ſix ſegments; at the extremity in the center is placed an oval germen, ſupporting a ſingle ſtyle ſurrounded by ſix filaments; its fruit is contained in an oblong capſule, divided into three cells, filled with a number of angulated ſeeds. There are great variety of aloes, the major part of which are natives of Africa, and of all the different claſſes of ſucculent plants, are the greateſt ornament to our green-houſes. Some ſorts produce but triflling flowers, but there is ample amends made in the beauty and ſingularity of their leaves, which are ſo very different, that if contraſted together, they appear as though they did not belong to the ſame genus. Theſe plants are increaſed from off-ſets, which on ſome ſorts grow very plentifully, and ſhould be planted in a poor ſoil, ſuch as brick, rubbiſh, &c. in the ſummer months, and muſt have but little water till they are well rooted. Where there is conveniency to ſuit, if plunged in a tan-bed in the ſtove it will facilitate their growth; or they may be ſtuck in the bark till they are rooted and then potted.—Some ſorts that do not ſo freely increaſe, it may be neceſſary to multiply them by cutting the top off, except in ſome particular ſorts, which will not admit of it, which will be a means of producing ſeveral young plants around the place of inciſion, which at a proper ſeaſon, may be taken off and planted, obſerving to let them dry a few days to heal their wounds which were cauſed by ſeparation from their mother-plant; for planting them immediately may be a means of their rotting. —Theſe plants, though moſt of them will bear being out in the air in ſummer, yet in cool weather, which ſometimes happens, they are apt to have their colour changed, from a fine diverſified green to a duſky colour, which makes them appear unſightly; therefore to have them in their greateſt beauty, which in moſt ſorts conſiſts in their foliage, they ſhould be under ſhelter all the year; and though many ſorts may be kept in a common green-houſe, yet if placed on the flue of a ſtove, or hot-houſe, they will keep growing all the winter, and ſeveral will ſhew their flowers at a time of year when few plants produce their bloſſoms; likewiſe there is not the danger of rotting ſo much as when placed where there is no fire, for in ſuch a ſituation they muſt be kept extremely dry on account of their ſucculency, and conſequently are in a ſtate of inaction during the winter. Botaniſts enumerate between thirty and forty ſorts of aloes, among whom was formerly claſſed the large American aloe, commonly called ſo; but as there is a very conſiderable difference, both in the compo-

nent

nent parts of the flower, as alſo in the plants themſelves, Dr. Linnæus has thought proper to claſs it as a diſtinct genus, by the name of agave. This plant is ſo ſlow a grower in this climate, that it may, and has been kept ſixty, ſeventy, or eighty years before it produces its bloſſoms; but when it is arrived to a ſtate for blowing, the flower-ſtem ariſes from the center of the plant, and advances with ſuch rapidity in its growth, that in ſix or ſeven weeks it will be eighteen or twenty feet high, ornamented with large bunches of flowers of a yellow colour, connected to foot-ſtalks, in form of an S, which are affixed alternately on the main ſtem, diminiſhing in ſize from about a third upward of the ſtem to the top. There have ſeveral of the common aloes blown in England, which are looked upon as great curioſities: when the flower is gone, the decay of the plant follows, but leaves a number of ſmall plants or ſuckers to ſucceed. There are different ſorts of theſe aloes, but the moſt beautiful is a variety of the common ſort, having ſtriped leaves; when this plant is grown to a large ſize, it makes a moſt grand appearance.

ALOES, in the materia medica, a bitter, gummy, reſinous, inſpiſſated juice, prepared from the leaves of the above ſpecies of plants. There are three different ſorts of aloes found in the ſhops, diſtinguiſhed by the names of *ſocotrine*, *hepatic*, and *caballine*.

ALOE *Socotorina*. Socotorine aloes are brought from the iſland Socotora, in the Indian ocean, wrapt in ſkins; and obtained from the *aloe ſocotorina anguſtifolia ſpinoſa flore purpureo*. This ſort of aloes is of a bright ſurface, and in ſome degree pellucid, in the lump; of a yelloviſh red colour, with a purpliſh caſt: when reduced into powder, of a golden colour. It is hard and friable in the winter; ſomewhat pliable in the ſummer, and ſoftens betwixt the fingers. Its bitter taſte is accompanied with armotic flavour, but not ſufficient to prevent its being diſagreeable: the ſmell is not very unpleaſant, and ſomewhat reſembles that of myrrh.

ALOE *Hepatica*. Hepatic, Barbadoes, or common aloes, are uſually brought from Barbadoes; the beſt ſort in large gourd ſhells; an inferior kind in pots; and a ſtill worſe in caſks; and extracted from the *aloe dioſcoridis et aliorum*, of Sloan. This is darker coloured than the foregoing, and not ſo clear or bright. It is generally drier and more compact; though ſometimes, eſpecially the caſk ſort, quite ſoft and clammy. Its ſmell is much ſtronger and more diſagreeable; the taſte intenſely bitter and nauſeous, with little or nothing of the aromatic flavour of the ſocotorine.

ALOE *Caballina*. Caballine, or horſe aloes, are prepared, probably, from the *aloe guineenſis cabillina vulgari ſimilis ſed tota maculata*, and not, as is generally ſuppoſed, from the feces of the hepatic; the difference not being in purity, but in quality. It is eaſily diſtinguiſhed from both the foregoing by its ſtrong rank ſmell: in other reſpects it agrees pretty much with the hepatic; and is, not unfrequently, ſold in its place. Sometimes it is prepared ſo pure and bright as ſcarce to be diſtinguiſhable by the eye, even from the ſocotorine; but its offenſive ſmell readily betrays it: and if this alſo ſhould be diſſipated by art, its wanting the aromatic flavour of the finer aloes will be a ſufficient criterion.

Aloes is a ſtimulating cathartic bitter: taken in ſufficient doſes to purge effectually, as two ſcruples or a dram, it occaſions commonly a great irritation about the anus, and ſometimes a diſcharge of blood. In ſmaller doſes, as ten or twelve grains, repeated once or twice a day, it not only evacuates the firſt paſſages, but attenuates and diſſolves viſcid humours in the remoter parts; warms the habit, quickens the circulation, and promotes the menſtrual and hæmorrhoidal fluxes: its continued uſe renders the blood ſenſibly more fluid, as appears on veneſection. For a time, in theſe ſmall doſes, it does not act by ſtool; but at length it produces a gentle looſeneſs, of longer continuance than that occaſioned by moſt other purgatives: hence its utility in habitual coſtiveneſs. This ſtimulating cathartic is particularly adapted to perſons of a phlegmatic temperament and ſedentary life, to cachectic indiſpoſitions, and oppreſſions of the ſtomach by viſcid crudities contracted from irregularity: in dry bilious habits it is often injurious, immoderately heating the blood, or inflaming the bowels.

This bitter juice is accounted deſtructive to worms (or to the matter which favours their production) whether taken internally, or applied in plaiſters to the umbilical region. It is powerfully antiſeptic; and commonly made an ingredient in tinctures and balſams for cleanſing and healing wounds or putrid ſores.

Aloes is ſometimes taken by itſelf, ſometimes mixed with ſaponaceous medicines, warmed with aromatics, acuated with pungent materials, combined with the deobſtruent gums, &c. Many of theſe kinds of compoſitions have been received as officinals: a pill, for example, compoſed of equal parts of aloes and ſoap, with a proper quantity of thin honey: a powder, of eight parts of aloes, with two of canella alba, or with one of virginian ſnake root, and one of ginger: a tincture made by digeſting five ounces of theſe powders in five or ſix pints of mountain wine: pills of four parts of aloes, two of myrrh, and two or one of ſaffron, made up with ſyrup of ſaffron, or of orange peel: vinous and ſpirituous tinctures of the aloes, with different proportions of the myrrh and ſaffron, &c.

Among different aromatic materials made trial of, cloves ſeemed the beſt adapted for alleviating the offenſiveneſs of the aloes: the committee appointed

pointed by the London college for reforming their pharmacopœia, made choice of canella alba, on account of its not rendering the medicine ſo hot as the neceſſary quantity of the clove itſelf would do, and yet having ſo much of the clove flavour, as to cover the aloes in a ſufficient degree: ſome commend the caſia caryophyelata, or clove bark, as having more of the clove flavour than canella alba, and yet not being very hot. Where volatile ſpirits are to be joined, a ſolution of the aloes, in dulcified ſpirit of ſal ammoniac, or in ſpirit of ſal ammoniac made with quick-lime, are very elegant preparations, and require little aſſiſtance from aromatics to render them ſupportable to the palate; the offenſiveneſs of the aloes being greatly abated by the ſpirit, and the pungency of the ſpirit ſheathed by the aloes; the ſpirit of ſal ammoniac made fixed with alkaline ſalt, does not diſſolve near ſo much of the aloes as the two abovementioned.

ALOES *Wood*. See XYLOALOES.

ALOETICS, a general name for all medicines, whoſe baſis or principal ingredient is aloes.

ALOGIANS, in eccleſiaſtical hiſtory, a ſect of ancient heretics, who denied that Jeſus Chriſt is the logos, or eternal word; and therefore they rejected the goſpel of St. John as a ſpurious production.

The word is Greek, and compounded of α, priv. and λογος, the word.

ALOIDES, in botany. See STRATIOTES.

ALOPECIA, in medicine, implies a falling off of the hair, occaſioned either by a defect of nouriſhment, or a bad ſtate of the humours.

ALOPECURUS, fox-tail graſs, in botany, a diſtinct genus of plants; it produces a triandrious flower, conſiſting of one hollow valve with a long awn or beard inſerted on its back part; near the baſe the germen is round, ſupporting two ſtyles, and contains a ſingle round ſeed in a cover.

ALP, a name given to the bullfinch, in ſeveral parts of England. See BULLFINCH.

ALPHA, the name of the firſt letter of the Greek alphabet, anſwering to our A.

As a numeral it ſtands for one, or the firſt of any thing; hence alpha and ómega, being the firſt and laſt letters in the Greek alphabet, are uſed to ſignify the eternity of God.

ALPHABET, the natural or cuſtomary ſeries of the ſeveral letters of a language.

The word is formed from *alpha*, and *beta*, the firſt and ſecond letters of the Greek alphabet.

The number of letters is different in the alphabets of different languages. The Engliſh alphabet contains 24 letters, to which if we add *j* and *v* conſonant, the ſum will be 26; the French 23; the Hebrew, Chaldee, Syriac, and Samaritan, 22 each; the Arabic 28; the Perſian 31; the Turkiſh 33; the Georgian 36; the Coptic 32; the Muſcovite 43; the Greek 24; the Latin 22; the Sclavonic 27; the Dutch 26; the Spaniſh 27; the Italian 20; the Ethiopic and Tartarian, each 202; the Indians of Bengal 21; the Barameſe 19. The Chineſe have, properly ſpeaking, no alphabet, except we call their whole language by that name: their letters are words, or rather hieroglyphics, amounting to about 80,000.

ALPHABET is alſo uſed for a cypher, or table of the uſual letters of the alphabet, with the correſpondent ſecret characters, and other blank ſymbols intended to render the writing more difficult to be decyphered.

ALPHABET, among merchants, a kind of index, with the twenty-four letters in their natural order, in which are ſet down the names of thoſe who have open accounts, referring to the folios of the ledger.

ALPHABETICAL, ſomething belonging to, or placed in the order of, the alphabet.

ALPHETA, in aſtronomy, the name of a fixed ſtar of the ſecond magnitude in the northern crown, and generally called *lucida coronis*. See the conſtellation CORONA *ſeptentrionale*.

ALPHONSIN, in ſurgery, an inſtrument for extracting bullets out of gun-ſhot wounds.

This inſtrument derives its name from the inventor Alphonſus Ferrier, a phyſician of Naples. It conſiſts of three branches, which are cloſed by a ring. When cloſed and introduced into the wound, the operator draws back the ring towards the handle, upon which the branches opening take hold of the ball; and then the ring is puſhed from the haft, by which means the branches graſp the ball ſo firmly as to extract it from the wound.

ALPHONSINE *Tables*, aſtronomical tables computed by order of Alphonſus, king of Caſtile: that prince is even ſuppoſed to have aſſiſted in the conſtruction.

ALPHOS, among phyſicians, a diſeaſe of the ſkin, otherwiſe called *vitiligo*, when that membrane is ſprinkled, or, as it were covered with white ſpots. Several authors conſider it as a ſymptom of the leproſy. See the article LEPROSY.

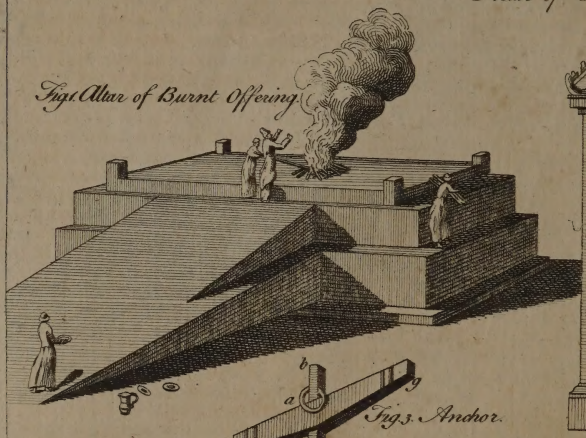
The word is Greek αλφος, a radix in that language, and ſignifies white.

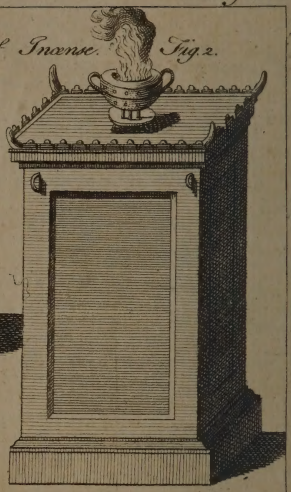
ALRAMECH, in aſtronomy, the Arabic name of a ſtar of the firſt magnitude, commonly called Arcturus. See ARCTURUS.

ALSINE, chickweed, in botany, a genus of pentandrious plants. The middle kind called *alſine media*, by C. Bauhine, is the chickweed of the ſhops, and grows wild in moſt gardens, and often on dunghills. The flowers which are ſmall and roſaceous, are produced in great plenty from early in the ſpring till Midſummer. The whole plant may be uſed medicinally, and is accounted cooling,

Altar of Incense. Fig. 2.

Fig. 1. Altar of Burnt Offering.





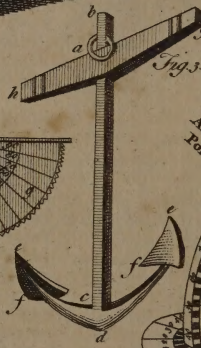


Fig. 3. Anchor.

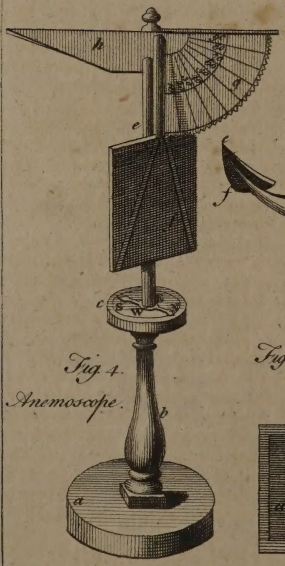


Fig. 4.
Anemoscope.

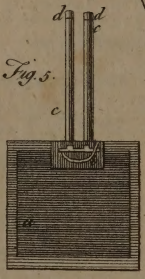


Fig. 5.

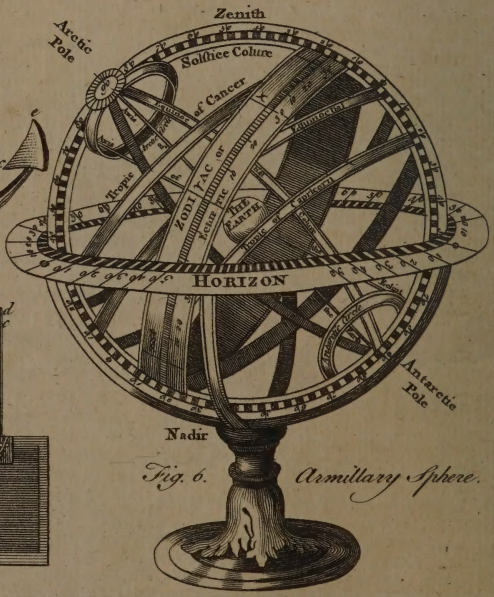


Fig. 6. Armillary Sphere.

ing, and therefore good in fevers, and in conſumptions ariſing from hectical diſorders.

ALT in muſic, a term applied to the high notes in the ſcale. See GAMUT.

ALTAR, a kind of table of wood, or ſtone, or metal, elevated above the ground, upon which ſacrifices were offered to ſome deity.

Amongſt the Romans the altar was a ſort of pedeſtal, either ſquare or round, or triangular, adorned with ſculpture, bas-relievos, and inſcriptions, whereon the victims were burnt which they ſacrificed to their idols.

The Greeks diſtinguiſhed two different kinds of altars, one they called βωμος, which was the real altar, on which they ſacrificed to their gods; the other was termed εσχαρα, being much ſmaller, and only a ſort of hearth, on which they offered up ſacrifices to their heroes.

The heathens had a cuſtom, when they made any ſolemn vow, to lay hold on the altar; to which Pericles alludes, when he ſays, "*You may be a friend as far as to the altar*;" as if he had ſaid, you may love your friend ſo well, as to do any thing but forſwear yourſelf for him. Their altars could not be touched, nor even approached, without ſacrilege, by perſons who had committed murder, or women who had been defiled. They were the moſt ſacred aſylums, as well to the innocent as the guilty, none being forced from them, but thoſe who had committed the moſt enormous villainies.

Altars are of great antiquity amongſt the Jewiſh nation: Noah when he came out of the ark built an altar, and offered up ſacrifices to the Lord: Abraham erected another in Sichem, and one in the plain of Mamre. The altars, which God commanded Moſes to make, were to be of earth, or rough ſtones; it being expreſly forbidden that they ſhould be hewn. In the tabernacle were two altars; one the brazen altar, which was for burnt-offerings, and the other the altar of incenſe, made of gold.

ALTAR *of Burnt-offerings*, was a kind of coffer, made of Shittim-wood, covered with plates of braſs: its height was three cubits, and its breadth five cubits. It was placed by Moſes to the eaſt, before the entrance of the tabernacle, in the open air, that the fire which was kept upon it continually, might not fully the inſide of the tabernacle. At each of the four corners of this altar, there was a ſpire in the appearance of a horn, wrought out of the ſame piece of wood with the altar itſelf, and covered with braſs: within the altar was a grate of braſs, on which the fire was made; and through this grate fell the aſhes, in proportion as they encreaſed upon the altar, and were received below, within a pan, which was placed under it. At the four corners of this grate were four rings and four chains, which kept it up at the four horns of the altar. This altar was portable, and was carried on the ſhoulders of the prieſts, by ſtaves of Shittim-wood, overlaid with braſs, and put into rings faſtened to the ſides of the altar. Such was the altar of burnt-offerings belonging to the tabernacle, erected by Moſes in the wilderneſs: but the altar of burnt-offerings, erected in Solomon's temple, was much larger, being twenty cubits ſquare, and ten high. It was covered with thick plates of braſs, and filled with rough ſtones; and on the eaſt ſide there was an eaſy aſcent leading up to it.

After the return of the Jews from captivity, and the building of the ſecond temple by Zerubbabel, their altars were in ſome reſpects different from thoſe in uſe before the captivity, being compoſed of large piles of unhewn ſtones, thirty-two cubits ſquare at the bottom, and twenty-four cubits at the top. The aſcent to this altar was by a gentle riſing, thirty-two cubits in length, and ſixteen in breadth. See Plate IV. *fig.* 1.

ALTAR *of Incenſe*, was a ſmall table of Shittim-wood, covered with plates of pure gold, one cubit ſquare and two high. At each of the four corners thereof was a horn; round it was a ſmall border, and over it a crown of gold. Every morning and evening the officiating prieſt offered incenſe upon this altar: for which end he entered with the ſmoaking cenſer, filled with fire from the altar of burnt-offerings, into the ſanctuary, or holy place, where this altar was fixed over-againſt the table of ſhew-bread. The prieſt, having placed the cenſer upon it, retired out of the ſanctuary. This was the altar which was hidden by Jeremiah before the captivity. See Plate IV. *fig.* 2.

ALTAR, or *Table for the ſhew-bread*, was of Shittim-wood, covered with plates of gold: it had a little border round it, adorned with ſculpture, and was two cubits in length, one in breadth, and one and a half in height. It was placed in the ſanctuary to hold the *ſhew-bread*; which were twelve cakes, made in a ſquare form, having, as it were *four faces* or ſides. The Hebrew term for this ſort of bread, ſignifies literally *bread of faces*. It was called the ſhew-bread, becauſe it was expoſed to public view before the ark: none but the prieſts could lawfully eat of this bread, which was ſerved up hot on the Sabbath-day; and at the ſame time the ſtale ones, which had been expoſed during the whole week before, were taken away. The offering of the ſhew-bread was accompanied with ſalt and frankincenſe, which was burnt upon the table, at the time when they ſet on freſh cakes. Authors are not agreed as to the manner of ranging the cakes of ſhew-bread upon the table. Some think they were placed in three piles, containing four cakes each; others ſay, there were but two piles of ſix cakes. The rabbins tell us, that between every two cakes, there were two golden pipes, ſupported by forks of the ſame metal, whoſe end reſted

reſted upon the ground to convey air to the loaves, and hinder them from growing mouldy.

The ALTAR, which was obſerved by St. Paul at Athens, dedicated αγνωστω θεω, *to the unknown God*, has puzzled the moſt learned commentators, to determine preciſely what it was: becauſe it was uſual among the heathens to engrave upon their altars the name or proper enſign of the deity, to whom they were dedicated. Some follow the opinion of St. Jerom, who informs us, that the inſcription was not exactly as St. Paul relates, but that the words were, "To the Gods of Aſia, "Europe, and Africa; to the unknown and "ſtrange Gods." Others think that St. Paul propoſed to ſpeak of thoſe altars, which were to be ſeen in ſeveral parts of Attica, without any particular inſcription, and erected after a ſolemn expiation of the country, made by the philoſopher Epimenides. But it ſeems to us unneceſſary to go in ſearch of foreign and difficult interpretations of this paſſage, as it may be taken in its plain and literal meaning. Lucian in his Dialogue, entitled, Philopatris, ſwears by the *unknown God* of Athens; and adds, "Being come to Athens, and "finding there the *unknown God*, we worſhipped "him, and gave thanks to him, with hands lifted "up to heaven." This ſingle authority proves inconteſtibly that there was an altar at Athens erected to the unknown God, with the very inſcription mentioned by the Apoſtle.

ALTAR, in the modern uſe of the word, ſignifies the communion table.

ALTAR, or ARA, in aſtronomy, a conſtellation of the ſouthern hemiſphere, containing ſeven ſtars, whereof five are of the fourth magnitude, and two of the fifth; this conſtellation is not viſible in our climate.

ALTARAGE, the profits which the prieſt receives on account of the altar.

ALTERANTS, in medicine. See the article ALTERATIVES.

ALTERATE, in muſic and geometry. See SESQUIALTERATE.

ALTERATIVES, or ALTERATIVE medicines, in the healing art, are ſuch medicines as correct the bad qualities of the animal fluids, without occaſioning any ſenſible evacuation.

ALTERCUM, in botany, a name given by ſome old writers to a plant now called hyoſcyamus. See the article HYOSCYAMUS.

ALTERN-BASE, in trigonometry, is a term uſed in contradiſtinction to the true baſe. Thus, in oblique triangles, when the true baſe is the ſum of the ſides, then the difference of the ſides is the altern-baſe; but when the difference of the ſides is the true baſe, then the ſum of the ſides is called the altern-baſe.

ALTERNATE, in a general ſenſe, ſignifies a term applied to ſuch perſons or things, as ſucceed each other by turns.

ALTERNATE, in botany, is ſuch a diſpoſition of the leaves of ſome plants, that the firſt leaf on one ſide of a branch ſtands higher than the firſt on the other ſide, the ſecond leaf the ſame, and ſo continued to the top.

ALTERNATE, in heraldry, is ſaid with regard to the ſituation of the quarters. Thus the firſt and fourth quarters, and the ſecond and third, are uſually of the ſame nature, and are thence called alternate quarters.

ALTERNATE *Angles*, in geometry. See ANGLES.

ALTERNATE *Ratio*, is the ratio of antecedent to antecedent, and conſequent to conſequent, in any proportion. Thus if A : B :: C : D. then will the ratio of A to C, be as the ratio of B to D, which is alternate; hence this kind of proportion can only take place when the quantities are of the ſame kind.

ALTERNATION properly ſignifies a ſucceſſion by turns.

ALTERNATION *of Quantities* is a term uſed to expreſs the different ways, that any particular number of things may be varied, changed, or combined. See COMBINATION.

ALTERNATIVE, in a general ſenſe, implies nearly the ſame as alternate. See ALTERNATE.

ALTHÆA, marſhmallow, in botany, a genus of plants producing a flower with a double empalement; the outer one is monophyllous, irregularly divided at the extremity into nine narrow parts, the interior empalement is alſo compoſed of one leaf, cut at the top into five broad ſegments, and are both premanent, the flower contains five heart-ſhaped petals, which join together at the baſe; the filaments are numerous, joined below in a cylindrical form, but looſe at the tops, and are inſerted in the corollæ; in the center is placed an orbiculated germen, ſupporting a ſhort cylindrical ſtyle, topped with a numerous ſtigma; the empalement becomes afterward a round depreſſed capſulæ, divided into ſeveral cells, each containing a ſingle compreſſed kidney-ſhaped ſeed.

The common althæa grows in moiſt places in divers parts of England, the root is perennial, but the ſtalk is annual, and dies to the ground every autumn; the ſtalk is upright, with a few ſmall ſide branches, and furniſhed with hoary ſoft angulated leaves; the flower blows in July and Auguſt, and comes out from the wings of the leaves ſhaped like the common mallow, but leſs, and of a paler colour.

In medicine the leaves of this plant afford a very ſoft mucilaginous ſubſtance in decoction, which is therefore good in all complaints ariſing from acrimony; thus it is of great ſervice in dyſenteries,

Order.	Magn.	Name.	Bayer's Letters.	Right Aſcenſion	Declination.	Var. in Right Aſcen.	Var. in Declination
				° ′ ″	° ′ ″	″	″
17	4		ι	351.44.22	41.59.12	43.2	19.8
18	6			352. 2.44	49.12.18	43.1	19.8
19	4		K	352.17.40	43. 4.32	43.2	19.8
20	5.6		Ψ	353.40.21	45. 9.24	43.3	19.9
21	2	Caput	α	358. 8. 5	27.49. 1	44.6	20.5
22	5			359.36. 0	44.48.14	44.0	20.0
23	6			0.24.36	39.46.38	44.6	20.1
24	4.5		θ	1.14. 6	36.14. 8	45.3	20.1
25	5		σ	1.32.40	45.30.48	45.3	20.1
26	6			1.39. 7	42.31.23	45.2	20.1
27	5		ρ	2.12.50	36.41.48	45.3	20.1
28	6			4.27.43	28.28.29	45.4	20.0
29	4.5		ϖ	6. 6.42	32.26.52	46.0	20.0
30	4		ε	6.35.36	28. 3.36	46.6	20.0
31	3		δ	6.46.7½	29.35.43	47.4	20.1
32	6			7.10.44	38.11.26	47.8	20.0
33	neb			7.31.57	40. 1.28	48.0	20.1
34	4		ζ	8.48.22	23. 0.41	48.0	20.0
35	4		ν	9.15.49	39.50.45	49.0	20.0
36	6			10.42. 3	22.24.21	48.0	20.0
37	4.3		μ	10.57.41	37.14. 1	49.3	19.8
38	4.5		η	11.16.36	28.12. 0	48.0	19.8
39	6			12.31. 6	40. 7.47	50.0	19.8
40	6			12.35. 5	30.34.42	49.5	19.7
41	5		d	13.43.19	42.43.28	49.6	19.5
42	5		φ	14. 4. 8	46. 2.12	49.8	19.5
43	2	Mirach	β	14.13.50	34.23.41	49.5	19.4
44	6			14.20.27	30.52. 5	49.6	19.5
45	5.6			14.35.10	36.30.30	49.5	19.5
46	4.5			17.12.45	44.19.12	49.8	19.2
47	6			17.38.48	36.30.51	49.7	19.1
48	5			18.29.10	44.13.12	49.8	19.1
49	5		ξ	19. 6.10	45.48.54	49.8	19.1
50	6.5		υ	20.50. 9	30.25.36	49.8	19.0
51	5	Perſei	υ	20.58.15	47.28. 3	49.9	18.9
52	6	2da ad	λ	21.23.53	47.13. 4	49.9	18.7
53	5		τ	21.45.45	39.24.27	49.8	18.5
54	4	Perſei	φ	22.19.15	49.31.54	50.0	18.5
55	neb			24.53.30	39.35.22	50.0	18.2
56	6			25.38.31	36. 6.53	50.0	18.0
57	2.3	Alamac	γ	27.28. 7	41.13. 5	51.2	17.8
58	6			28.40.15	36.45.34	51.0	17.6
59	6			29.15.34	37.56.48	52.0	17.5
60	6		b	29.42.28	43. 8.51	53.0	17.4
61	6			30.44.52	47.45.26	52.5	17.2
62	6		c	31. 8.17	46. 8.37	52.6	17.2
63	6			31.27.38	49. 5.11	52.5	17.1
64	6			32.49.24	48.57.18	53.1	17.0
65	5			32.46.50	49.13.43	53.3	17.0
66	6.7			33. 9. 8	49.32.31	53.4	16.9

The right aſcenſion and declination of the above catalogue is ſettled to the year 1770.

ANDROMEDA, in botany, a genus of plants, bearing a monopetalous flower, of an oval and campanulated form, divided into five ſegments at the brim, which are reflexed: it contains ten tubulated filaments, which are ſhorter than the corolla; and affixed to it in the center is placed a roundiſh germen, which becomes a pentagonal capſule, containing five cells, which are filled with many ſmall round ſeeds: moſt of the ſpecies of this genus are natives of North America; one of which is the chamædaphne of J. Buxbaume.

ANDROSACE, in botany, a genus of umbelliferous plants, whoſe flowers conſiſt of a five cornered monophyllous cup; the corolla is a monopetalous oval tube, incloſed in the empalement, divided at the brim into five parts, in which is inſerted five ſhort filaments, crowned with oblong erect antheræ; the germen is round, ſupporting a ſhort filiform ſtyle, topped with a globoſe ſtigma; the calyx afterwards becomes a globoſe capſule of one cell, opening in five parts, containing ſeveral roundiſh ſeeds. This genus are all natives of foreign countries.

ANDROSÆMUM, tutſan, in botany, conſtituting a diſtinct genus of plants, according to Tournefort; but is comprehended by Linnæus among the hypericums. See the article HYPERICUM.

ANDRYALA, in botany, a genus of plants, called by Vaillant eriphorus, and in Engliſh downy ſow thiſtle; the cup of the flower is ſhort, hairy, and round, cut in many parts; the flower is compoſed of many equal hermaphrodite florets, which are monopetalous, and contain five ſhort hairy filaments, topped with cylindrical tubulous antheræ; the oviary, which is ſituated at the bottom of each floret, ſupports a filiform ſtyle, the length of the filaments, crowned with two reflexed ſtigma; the oviary becomes afterward an oval ſeed, topped with down. The ſpecies of this genus are natives of France, Spain, and Italy.

ANECDOTE, among hiſtorians, implies ſome fact not formerly publiſhed to the world, or very little known.

The word is Greek, ἀνέκδοτος, and compounded of ἀ, priv. and ἐκδοτος, publiſhed.

ANEMUS, in ſome chemical authors, implies a wind-furnace uſed in making ſtrong fires for fluxing metals, &c.

The word is formed from the Greek, ἄνεμος, the wind.

ANEMOMETER, an inſtrument to meaſure the force or power of the wind, firſt invented by Wolfius, and mentioned in his Areometer publiſhed in the year 1709; and likewiſe in his Elem. Matheſ. as well as in his Mathematical Dictionary. He tells us, the ſtructure is ſuch that it may be preſerved even to meaſure the force of running water, or that of men, horſes, &c. when they draw. In the Memoirs of the Academy of Sciences, there is given the deſcription of a new ane-

mometer, which not only expreſſes on paper the ſeveral winds that have blown for twenty-four hours, but alſo the power and velocity of each. See the articles WIND and VELOCITY, for the deſcription, conſtruction, &c. of this inſtrument.

ANEMONIE, the wind-flower, in botany, a genus of polyandrious plants: the flower conſiſts of two or three orders of petals, which are oblong, and diſpoſed in three ſeries over each other; the filaments are capillary and numerous, topped with double upright antheræ; the germina are many, and collected in the head of the flower, each crowned with an obtuſe ſtigma. It is deſtitute both of calyx and pericarpium, but the receptacle is globoſe or oblong, attenuated and punctuated, and produces numerous and acuminated ſeeds, incloſed with a down, having the ſtyles affixed to them. There are two ſorts of ſpecies in this genus, the cultivated and the wild. Thoſe that are raiſed in gardens, produce a fine variety of beautiful flowers, which bloſſom in April: the root is tuberous and irregular, of a darkiſh brown on the outſide, whitiſh within, and hung with many thick fibres, dividing itſelf in time into numerous heads. The leaves, ſupported by footſtalks, ariſe from the root, and are divided into a number of ſegments, and theſe are again ſubdivided into others: the flower ſtalk is round, and tolerably upright; it is not divided or branched, and is bare of leaves except at one place is ſituated a foliaceous involucrum, which is divided at the leaf, and on the ſummit of the ſtalk is placed the ſingle flower. Theſe flowers have of late years been cultivated with care, and as they are very beautiful, deſerve a place in every curious garden.

The ſeaſon to plant their roots is in October, obſerving to cover them in ſevere weather, and in the ſucceeding ſpring they produce their flowers: when the flower and leaves are decayed, the roots ſhould be taken out of the ground, and waſhed clean, dried, and put in a dry place, till the ſeaſon of planting. To have new varieties the ſeeds ſhould be ſaved, and as their down makes them adhere together, they ſhould be mixed with ſand, and well rubbed in the hand, to make them ſeparate and proper for ſowing; the time to do which is in the month of Auguſt, in light rich earth, obſerving to ſhade them from the ſun, and properly watered, where they ſhould remain till they blow, which will be in two or three years, when the goodneſs of them may be judged of, and ſelected accordingly.

ANEMOSCOPE, an inſtrument for ſhewing the velocity of the wind, and alſo the point of the compaſs from which it blows, by means of a hand or index to an upright dial, or circular plate, on which the ſaid points are delineated.

The index is turned by a horizontal axis, which axis is turned about by an upright ſtaff, at the top of which is the vane, and at the lower part is a cog-wheel, which puts the horizontal axis in motion, by means of a trundle-head fixed at its internal extremity. This inſtrument is extremely ſimple in its conſtruction, and requires nothing more than that the number of rounds in the trundle-head and cogs or teeth in the wheel be equal. The anemoſcope, as deſcribed in Plate IV. *fig.* 4. is what was invented by Mr. Pickering, and publiſhed in the Philoſophical Tranſactions, N° 473. The explanation, as given by the inventor, is as follows:

This anemoſcope is a machine four feet and a quarter high, conſiſting of a broad and weighty pedeſtal, a pillar faſtened into it, and an iron axis, of about half an inch diameter, faſtened into the pillar. Upon this axis turns a wooden tube, at the top of which is placed a vane, of the ſame materials, 21 inches long, conſiſting of a quadrant, graduated and ſhod with an iron rim, notched to each degree; and a counterpoiſe of wood, as in the figure, on the other. Through the centre of the quadrant runs an iron pin, upon which are faſtened two ſmall round pieces of wood, which ſerve as moveable radii to deſcribe the degrees upon the quadrant, and as handles to a velum or ſail, whoſe plane is one foot ſquare, made of canvas, ſtretched upon four battens, and painted. On the upper batten, next to the ſhod rim of the quadrant, is a ſmall ſpring, which catches at every notch correſponding to each degree, as the wind ſhall, by preſſing againſt the ſail, raiſe it up; and prevents the falling back of the ſail, upon leſſening of the force of the wind. At the bottom of the wooden tube is an iron index, which moves round a circular piece of wood faſtened to the top of the pillar on the pedeſtal, on which are deſcribed the thirty-two points of the compaſs. The figure of this machine may be ſeen, (Plate IV. *fig.* 4.) where *a* is the pedeſtal; *b*, the pillar in which the iron axis is fitted; *c*, the circle of wood, on which are deſcribed the 32 points of the compaſs; *e*, the wooden tube upon its axis; *f*, the velum; *g*, the graduated quadrant; *h*, the counterpoiſe of the vane.

Fig. 5. The velum takes off: *a*, the plane of the velum; *b*, the ſpring; *c*, *c*, the wooden radii; *d*, *d*, the holes through which the pin in the center of the quadrant goes. Its uſes are the following:

1. Having a circular motion round the iron axis, and being furniſhed with a vane at top, and index at the bottom, when once you have fixed the artificial cardinal points, deſcribed on the round piece of wood on the pillar, to the ſame quarters of the heavens, it gives a faithful account of that quarter from which the wind blows.

2. By having a velum or ſail elevated by the wind along the arch of the quadrant, to an height proportionable to the power of the column of wind preſſing

preſſing againſt it, the relative force of the wind, and its comparative power, at any two times of examination, may accurately be taken.

3. By having a ſpring fitted to the notches of the iron with which the quadrant is ſhod, the velum is prevented from returning back upon the fall of the wind; and the machine gives the force to the higheſt blaſt ſince the laſt time of examination, without the trouble of watching it.

The ingenious contriver of this machine tells us, that he carefully examined what dependence may be had upon it, during the ſtorms of February, 1743-4, and found that it anſwered exceeding well; for that, in ſuch winds as the ſailors call violent ſtorms, the machine had ſix degrees to ſpare for a more violent guſt, before it comes to a horizontal poſition.

It is certainly to be depended upon in ordinary weather, the velum being hung ſo tenderly as to feel the moſt gentle breeze. There is however reaſon to fear, that the expoſing the anemoſcope to all winds for a continuance, muſt diſorder it, eſpecially irregular blaſts and ſqualls. It may not therefore be amiſs, in violent weather, for the obſerver to take the tube with its vane and velum in his hand, in order to know the force of the wind; and, when he has finiſhed his obſervations, to carry the machine into the houſe, till the violence of the ſtorm is abated, when it may be replaced in its former ſituation.

ANETHUM, dill, in botany, an annual umbelliferous plant, with very finely divided leaves, and yellow flowers; producing pale yellowiſh oval ſeeds, flatted on one ſide, marked with three longitudinal ſtriæ on the other, and ſurrounded about the edges with a leafy margin. It is a native of the warmer climates, cultivated with us in gardens, flowers in July, and in September ſheds its ſeeds, by which the plant is plentifully propagated.

The ſeeds of dill have a moderately warm pungent taſte, and an aromatic ſmell, but not of the moſt agreeable kind; they are given as carminatives, to the quantity of a dram at a time, in flatulent colics, and indigeſtion from a laxity of the organs and viſcidity of the humours. The leaves are weaker and leſs grateful than the ſeeds; the roots have nothing of their flavour.

Water extracts very little of the virtues of dill ſeeds by infuſion or digeſtion for many hours. In boiling, their whole flavour exhales along with the watery vapour, and may be collected by diſtillation: the diſtilled water, drawn off to the quantity of a gallon from a pound of the ſeeds, is kept in the ſhops, and occaſionally made the baſis of carminative draughts and juleps. Along with the water ariſes a conſiderable portion of eſſential oil, in taſte moderately pungent, and ſmelling ſtrongly of the dill: this is given from one to three or four drops, or more, as a carminative, and in hiccups.

Rectified ſpirit, digeſted on dill ſeeds, readily extracts both their ſmell and taſte: the colour of the tincture is a bright yellow. The ſpirit, gently diſtilled off from the filtered liquor, brings over very little of its flavour, leaving in the extract nearly all the active parts of the dill.

ANEURISM, in ſurgery, a tumour ariſing from the dilatation or rupture of the coats of an artery. Aneuriſms uſually proceed from an artery being accidentally cut or pricked in bleeding, or from preternatural diſtention, or a corroſion of its coats, &c.

When an artery happens to be cut off by a lancet, the blood guſhes out impetuouſly by ſtarts, and is not eaſily ſtopped; an inflammation and change of colour in the part about the veſſel ſucceed, with a tumour and inability to move the arm, if the lancet were uſed there, from a collection of extravaſated blood lodged between the integuments and the interſtices of the muſcles. If the coats of the artery have been corroded, the ſymptoms are nearly the ſame, but come on more ſlowly, and prove leſs violent, without any hæmorrhage. The ſigns of a true aneuriſm, that is, when the dilatation of the coats of the artery happens, are a pulſation eaſy to be felt, and ſometimes viſible to the eye, the tumour generally appearing of the natural colour of the ſkin. This tumour varies in magnitude, being ſometimes as large as an orange, and at others, as big as a child's head; and, when preſſed with the finger, generally gives way, but preſently reſtores itſelf upon removal thereof.

An aneuriſm happening upon ſome error in venæſection, is dangerous; but if the blood ceaſes to flow from the wounded artery, and parts itſelf between the interſtices of the muſcles, the chirurgical operation is neceſſary; or if that be delayed for a few days, the extirpation of the limb becomes indiſpenſible. It is alſo dangerous if it proceeds from a corroſion of the coats of the artery; and the more ſo, when it happens in a part where the operation cannot be performed: but an aneuriſm from a diſtention of the canal, without any rupture, is ſeldom fatal; though reckoned, when large, incurable; the chief inconveniencies being the magnitude of the tumour, and pulſation. The diet in all theſe caſes ſhould be ſlender and balſamic, and the exerciſe gentle.

ANGARIA, in antiquity, a kind of public ſervice impoſed upon the provinces, which conſiſted in providing horſes and carriages for the conveyance of military ſtores from one place to another.

ANGARIA alſo ſignified any kind of oppreſſion or ſervice performed by compulſion.

ANGIOGRAPHY, among anatomiſts, ſignifies

fies a deſcription of the ſeveral veſſels of the human body; as the arteries, veins, lymphatics, nerves, &c.

The word is formed from the Greek, αγγειον, a veſſel, and γραφω, to deſcribe.

ANGEIOTOMY, in ſurgery, implies the opening a vein or artery, as in bleeding; and conſequently includes both arteriotomy and phlebotomy.

The word is formed from the Greek, αγγειον, a veſſel, and τεμνω, to cut.

ANGEL, a name given to the firſt and moſt exalted of all created beings; to thoſe pure, æthereal, intelligent ſpirits, who are employed by the Almighty to declare his will, or execute his commands, being for this reaſon called αγγελοι, (from αγγελλω, I ſend) that is meſſengers.

Angels have been diſtributed by ancient writers into three hierarchies, and theſe divided again into three claſſes. As thus:

1ſt Hierarchy.	2d Hierarchy.	3d Hierarchy.
Seraphin,	Dominations,	Principalities,
Cherubim,	Virtues,	Archangels,
Thrones,	Powers,	Angels.

The Seraphin are the moſt of all other ſpirits inflamed with holy love: the cherubim are the moſt enlightened, and communicate their rays and ſcience to the other orders: the Thrones are thoſe that encircle the majeſty of God: the Virtues are mighty to work wonders and miracles: the Powers counteract and prevent the malevolence of evil dæmons: the Dominations have the government of man: the Principalities have the charge of ſtates and kingdoms: Archangels are commiſſioned only on extraordinary occaſions; and Angels are the common heralds and meſſengers of heaven.

Whatever grounds there may be for this particular arrangement of ſpiritual beings into ſo many different claſſes, allotting to each their peculiar departments, it is not our preſent purpoſe to enquire: certain it is that there muſt be angels, or miniſtering ſpirits, ſince there has been no age or nation ſo blind or barbarous, as to have doubted of their exiſtence. The Greeks and Romans had their genii or dæmons, whom the Platoniſts in particular thought to have part in the government of the world. The Mahometans and Jews have always admitted them; and our Saviour and his Apoſtles bear teſtimony to their exiſtence. We find them in the holy ſcriptures commiſſioned by the Almighty to correct, improve, exhort; to declare his will, or manifeſt his anger; to aſſiſt the good, to comfort the afflicted, and to appal and puniſh the evil.

It is generally agreed by divines, that angels are pure and incorporeal ſubſtances, created by the great Author of Nature before the world, or at the ſame period. They are the miniſters of heaven, ſent down to ſuperintend human affairs: they have the charge not only of kingdoms and provinces, but of particular perſons, over whom they are perpetually watching, as ſo many faithful and affectionate guardians. This is a conſideration, which, if duly attended to, would not fail to make us cautious in what manner we conduct ourſelves; ſince there is no action ſo ſilent and ſecret, that is not immediately known to theſe attendant ſpirits.

It is impoſſible for us to know any thing certain of the nature of angels; but we may believe, that though of an order highly ſuperior to that of men, they are not compleat and perfect: for if they had been created thus originally, they could not have ſinned; which the holy ſcriptures inform us ſome of them did, in rebelling againſt the Almighty. For this reaſon, as they are themſelves imperfect beings, they cannot properly be the objects of our adoration; which ſhould be paid alone to that ONE SUPREME, who is omnipotent, immortal, infinite, the ſource and centre of every thing that is great, and good, and perfect.

ANGEL, in commerce, the name of a gold coin formerly current in England. It has its name from the figure of an angel repreſented upon it, weighed four pennyweights, and was twenty-three and a half carats fine. It had different values in different reigns; but is at preſent only an imaginary ſum, or money of account, implying ten ſhillings.

ANGELICA, in botany, a large umbelliferous plant, with hollow jointed ſtalks, and indented oval, pointed leaves, ſet in pairs along the middle rib, and having an odd one at the end, containing a milky juice, which on drying contracts a yellowiſh colour; the ribs of the leaves are channelled on the upper ſide, and joined to the ſtocks by large membraneous baſes or ſheaths. The ſeeds are of a pale whitiſh colour, ſomewhat oval, flat on one ſide, and convex, with three longitudinal ridges on the other, ſurrounded about the edges with a leafy margin. The roots are long and thick, of a dark brown colour on the ſurface, but the internal white and juicy; and, when dry, of a ſpongy texture.

There are two ſpecies of angelica, the wild and the garden, diſtinguiſhed by the epithets *ſylveſtris* and *ſativa*. The former grows wild, in moiſt grounds, in ſeveral parts of England; is perennial, and flowers in July: the latter is cultivated in gardens. They are ſimilar in quality; but the latter is ſuppoſed to be the ſtronger.

The garden angelica is naturally a biennial plant; but if the ſtalks are cut down before they run to flower, the roots will ſend forth new heads, and may by this means be continued for many years. The roots are in their greateſt perfection in the ſecond ſpring: they ſhould be thoroughly dried, kept in a dry place, and frequently aired, otherwiſe they will grow mouldy, and be eaten by worms.

Fig. 1. Angle.

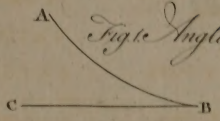


Fig. 2. Angle.

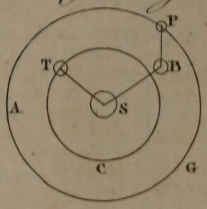


Fig. 3. Angle of Contact.

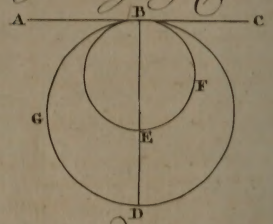


Fig. 4. Angle.

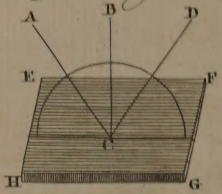


Fig. 5. Angle.

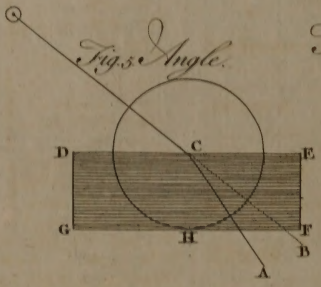


Fig. 6. Angle.

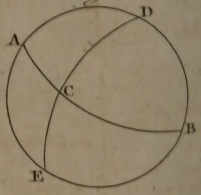


Fig. 7. Angle.

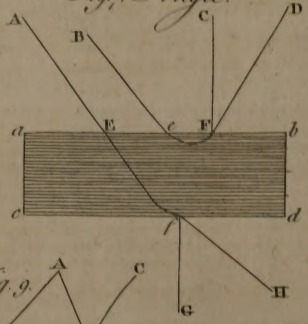


Fig. 8. Angle.

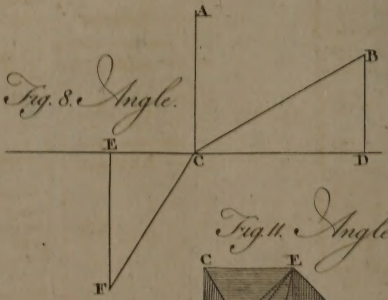


Fig. 9. Angle.

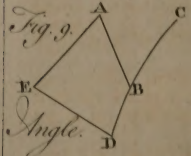


Fig. 10. Angle.

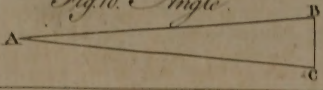
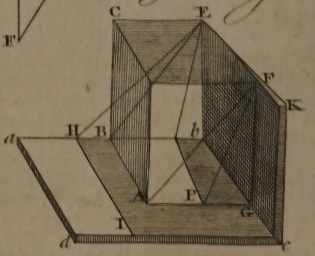


Fig. 11. Angle.



J. Lodge Sculp.

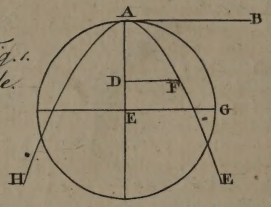


Fig. 1. Angle.

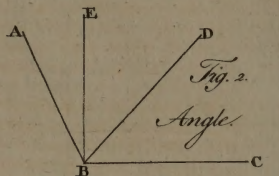


Fig. 2. Angle.

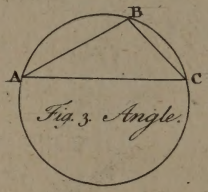


Fig. 3. Angle.

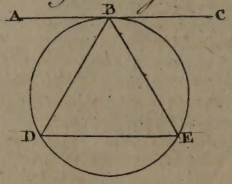


Fig. 4. Angle.

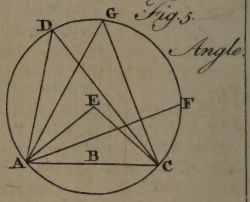


Fig. 5. Angle.

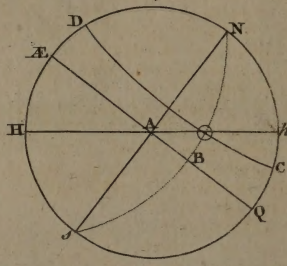


Fig. 6. Amplitude.

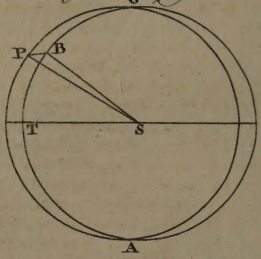


Fig. 7. Angle of Commutation.

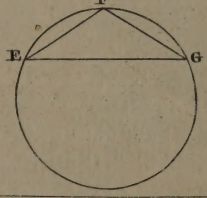


Fig. 8. Angle.

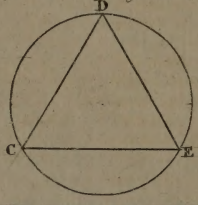


Fig. 9. Angle.

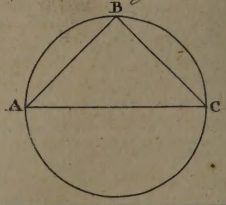


Fig. 10. Angle.

The roots of angelica are one of the principal aromatics of European growth, though not much regarded in the preſent practice. They have a fragrant agreeable ſmell, and a bitteriſh pungent, mixed with a pleaſant ſweetiſh taſte. On wounding the freſh roots early in the ſpring, it yields from the inner part of the bark, an unctuous and odorous juice, of a yellowiſh colour; and which, being gently exſiccated, retains its fragrancy, and proves an elegant aromatic gummy reſin. On cutting the freſh root longitudinally, the yellowiſh matter, in which the virtue and flavour of the angelica reſides, appears concreted into little veins. In this ſtate it readily and totally diſſolves by rectified ſpirit of wine, and tinges the menſtruum of a bright golden colour. On diſtilling off the ſpirit from this ſolution, very little of the flavour of the angelica riſes with it, nearly all the active matter of the root remaining concentrated in the extract. Water alſo gains from this root a pretty deep yellow colour, but extracts little of its taſte or ſmell. In diſtillation with water, there ariſes a ſmall portion of eſſential oil, of a highly pungent taſte, and ſmelling ſtrongly of the angelica: the remaining decoction, thus diveſted of the aromatic matter of the root, is nauſeouſly ſweetiſh and ſubacrid.

The other parts of the plant have the ſame taſte and flavour with the roots; but their active principles are far more periſhable. The ſeeds, which come neareſt to the roots, can ſcarcely be kept till the ſpring after they have been gathered, without loſing their vegetative power, as well as diminiſhing their medicinal virtues; and, with regard to the leaves, they loſe the greater part of their virtues on being barely dried: for ſome purpoſes, however, they are well adapted; the freſh leaves, as well as the ſeeds, being diſtilled with water, give over to the liquor the whole of their aromatic matter, which in this form proves ſufficiently durable. The virtues of the ſeeds, like that of the roots, is very imperfectly extracted by water, and completely by ſpirit; and though it riſes totally by diſtillation with water, is left by the ſpirit almoſt entire in the inſpiſſated extract. The ſpirituous tincture is of a bright ſtraw colour; the watery infuſion of a dark brown.

The ſtalks, candied with ſugar, make a very agreeable ſweetmeat.

ANGELICA, in antiquity, the name of a celebrated dance performed at the pagan feaſts of Greece; and ſo called from the dancers being dreſſed in the habit of meſſengers.

ANGELICS, *Angelici*, in eccleſiaſtical hiſtory, an ancient ſect of heretics, ſuppoſed to have obtained this appellation from their exceſſive veneration for angels.

ANGELICS is alſo the name of a congregation of nuns, founded at Milan in 1534, by Louiſa Torelli, counteſs of Guaſtalla. They obſerve the rule of St. Auguſtine.

ANGELICS is likewiſe the name of an order of knights inſtituted in 1191, by Angelus Flavius Comnenus, emperor of Conſtantinople.

Some will have this order, which ſtill ſubſiſts in Italy, to have been much more ancient, and to Conſtantine the Great was its founder.

ANGELITES, a ſect of heretics, ſo named from a certain place in Alexandria, called Agellius, or Angellius, where they firſt of all aſſembled. They followed the errors of Sabellius.

ANGELOT, the name of a gold coin ſtruck at Paris while ſubject to the Engliſh; and ſo called from the figure of an angel, ſupporting the arms of England and France.

ANGER, a violent paſſion of the mind, conſiſting in a propenſity to take vengeance on the author of ſome real or ſuppoſed injury done the offended party.

ANGERONA, in mythology, the name of a pagan deity whom the Romans prayed to for the cure of a diſtemper, called the quinzy, in Latin, *angina*. Pliny calls her the goddeſs of ſilence and calmneſs of mind, who baniſhes all uneaſineſs and melancholy. She is repreſented with her mouth covered, to denote patience and refraining from complaints. Her ſtatue was ſet up, and ſacrificed to, in the temple of the goddeſs Volupia, to ſhew that a patient enduring of affliction leads to pleaſure.

ANGERONALIA, feaſts inſtituted at Rome in honour of the goddeſs Angerona. They were celebrated on the 21ſt of December.

ANGINA, in phyſic, a violent inflammation of the throat, generally called quinzy. See the article QUINZY.

ANGINA *Lini*, in botany, a name by which ſome call the dodder growing on flax, from its choaking that plant.

ANGIOSPERMA, in the Linnæan ſyſtem of botany, implies thoſe plants of the didynæmia claſs, which have their ſeeds incloſed in a capſule or ſeed veſſel.

ANGLE, in geometry, is the mutual inclination of two lines, or of one line to another, which meet in a point; as the lines BA, CA, (plate VII. *fig.* 7.) meeting together in the point A. The lines AB and AC are called the legs of the angle, and the point of interſection A, the vertex.

Angles, either denoted by a ſingle letter affixed to the vertex as A, or by three letters, whereof the middle one denotes the angular point, as the angle formed by the lines AB and AC, is ſometimes called the angle BAC, or CAB.

ANGLE *Acute*, is one which is leſs than a right angle, or angle of 90°, as the angle DBC (plate VIII. *fig.* 2.)

ANGLES *Adjacent*, are such as have their vertexes in one point, being formed by one, two, or more right lines falling on another right line; or, by two or more circles intersecting another circle in the same point. Thus the angles ADC, CDB (plate VII. *fig.* 6.) are adjacent angles; and in plane geometry, their sum is always equal to two right angles; and therefore, if one of them be acute, the other must be obtuse, and the contrary: whence, also, if one of them be given, the other will be had, it being always the supplement to the other. See ANGLE *Obtuse*.

ANGLES *Alternate* are those, whether acute or obtuse, formed by a right line intersecting two parallel right lines. So, if AB and CD (plate VII. *fig.* 5.) are parallel the one to the other, and GH cuts them in E and F, the angles CEG, BFH, and AFE, DEF, are alternate angles.

The alternate angles are always equal to each other, *per* Simpson's Geom. 8. 1. 1st edit.

ANGLES *in Astrology* signify certain houses in a figure, or scheme of the heavens, constructed for any given time. Thus the horoscope of the first house is termed, the Angle of the East.

ANGLES *of a Battalion*, in the military art, are those soldiers who are placed where the ranks and files terminate. See BATTALION. The angles of a battalion are said to be blunted, when by any accident, or violent charge of the enemy, those soldiers are broken or killed. It was very common amongst the ancients to remove those parts of the battalion, and by that means form the square battalion into an octagonal one, and charge the enemy in that form; but this is now disused.

ANGLE *of a Bastion*, in fortification, is the angle ABC, formed by the two faces of the bastion AB and BC (plate X. *fig.* 4.)

ANGLE *at the Center of a Circle*, is an angle described in a circle, whose vertex, or angular point, is in the center of that circle.

ANGLE *at the Center*, in fortification, is the angle BOD (plate X. *fig.* 4.) formed at the center of the polygon, by lines drawn from thence to the points of the two adjacent bastions.

ANGLES *of the Circumference*, in fortification, is the angle made by the arc drawn from one gorge to another.

ANGLE, *at the Circumferenee of a Circle*, is an angle formed by two chords meeting in the circumference of a circle. Thus AD, DC (plate VIII. *fig.* 5.) are two chords of the circle ABC, making an angle D at the circumference, and is also called, an angle in a segment.

Per Simp. Geom. 11. 3. 2d edit. all angles at the circumference, standing on the same arc, are equal. Thus the angles ADC, and AGC, are equal to each other; and per 10. 3. of the same book, each equal half the angle at the center AEC.

If the arc ABC (*fig.* 10.) be a semi-circle, then the angle B will be a right angle: if it be greater than a semi-circle, as CDE (*fig.* 9.) the angle D will be an acute angle; but when less, as EFG, (*fig.* 8.) it will be an obtuse angle, *per* 11. 3. of Simp. Geom.

ANGLE *of Commutation*, in astronomy, is the angle comprehended between the true place of the sun seen from the earth, and that of a planet, reduced to the ecliptic. Thus, let ATBG (plate VIII. *fig.* 7.) be the orbit of the earth, APG that of any planet, S the sun, and B the planet's place reduced to the ecliptic; then will the angle TSB be the angle of commutation; which is thus found: subtract the planet's heliocentric place from that of the sun, and the remainder shall be the angle of commutation.

Note, As the sine of the angle of commutation is to the sine of the angle of elongation, so is the tangent of the heliocentric latitude of a planet to that of its geocentric.

ANGLE *of the Complement of the Line of Defence*, in fortification, is an angle made by the intersection of the two complements one with another.

ANGLE *of Contact*, is the angle ABK, (plate IX. *fig.* 3.) formed by the tangent AB and curve KB, at the point of contact B. Euclid, prop. 16. b. 3. demonstrates a very remarkable property in the circular angle of contact, viz. That it is less than any assignable right-lined angle; which, notwithstanding it is there demonstrated as clearly as any proposition in the whole book, has given rise to many disputes amongst the mathematicians of almost every age since Euclid. Peletarius, a French mathematician, asserts, that what Euclid calls the angle of contact is no angle at all: in answer to whom, old Clavius says, and perhaps rightly, that angles of contact are true angles; but of a different kind from a right-lined angle: but may be compared to it in the same manner as a line to a surface; and he gives this reason, "Because, if it be ever so often multiplied, it will never be equal to, or exceed a right-lined angle." Tacquet also, and our Dr. Wallis, seem to have fallen into the same error with Peletarius: the latter of which, in his discourse upon this subject, published in his Arithmetic of Infinites, says with Peletarius, that it is no angle; and the former, in a scholium to Prop. 16. l. 3. of his edition of Euclid, denies that any angle whatsoever can be compared to a finite quantity, being, he says, modes of quantities only; from whence it follows that angles cannot be compared to equality and inequality, but to likeness and unlikeness; which, if true, must overthrow every other proposition he has attempted to demonstrate throughout the whole book.

Upon the whole, angles of contact are certainly true angles, and may be compared with one another, though not with right-lined angles, as being infinitely

infinitely ſmaller. The circular angles of contact A B E, A B G, are to each other in the reciprocal, ſubduplicate ratio, of the diameters B D, and B E; parabolic ones in the ſame ratio to their reſpective parameters; but elliptical and hyperbolic angles of contact are reciprocally in the ſubduplicate ratio of the ratio compounded of the ratios of their parameters and tranverſe axes; and Sir Iſaac Newton ſays in his *Principia*, that if the curve H A E, (plate VIII. *fig.* 1.) be a cubic parabola, the angle of contact B A F will be infinitely greater than the circular one; alſo, that if there be a ſeries of parabolas of the higher kinds, deſcribed to the ſame axis and vertex, whoſe abciſſas A D, are as the ordinates D F^4, D F^5, D F^6, D F^7, D F^8, &c. there will ariſe a ſeries of angles of contact, every one of which will be infinitely greater than that immediately preceding it. It is to be regretted that this ingenious author proceeded no farther in this affair than he has done, as no doubt his penetrating genius would have diſcovered, and ſet this matter in the cleareſt light; whereas, without a demonſtration, it may almoſt be claſſed amongſt the marvellous. Mr. Stone has attempted to account for it in the following manner. It is known, ſays he, that if x be put for the abciſſa, and ſuppoſed infinitely ſmall quantity, that x, x^2, x^3, x^4, &c. and $x^{\frac{1}{2}}$, $x^{\frac{1}{3}}$, $x^{\frac{1}{4}}$, will be each a ſeries of quantities continually decreaſing; alſo, that x, $x^{\frac{1}{2}}$, $x^{\frac{1}{3}}$, $x^{\frac{1}{4}}$, &c. and $x^{\frac{1}{2}}$, $x^{\frac{1}{3}}$, $x^{\frac{1}{4}}$, will be each a ſeries of quantities continually increaſing; now as x is ſuppoſed infinitely ſmall, every one of theſe terms muſt be infinitely greater than that which preceded it; between which progreſſion, and the ſubject we have been treating of, he apprehends ſome analogy.

ANGLE *of the Courſe*, in navigation; ſee COURSE and RUMB.

ANGLE *of the Counterſcarp*, in fortification, is that made by the two ſides of the counterſcarp meeting before the middle of the curtain.

ANGLE *of the Curtain*; ſee ANGLE *of the flank*.

ANGLE, *Curve lined*; ſee *ſpherical* ANGLE.

ANGLE *Diminiſhed*, in fortification, is that which is made by the meeting of the outermoſt ſide of the polygon with the face of the baſtion.

ANGLE *of the Ecliptic*; ſee *Parallactic* ANGLE.

ANGLE *of Elevation*, in gunnery, is that which the axis of the hollow cylinder, or barrel of the gun, makes with a horizontal line; ſee ELEVATION.

ANGLE *of Emergence*, is that which any body, &c. projected from one fluid, or medium, into another, makes at its quitting the latter with a perpendicular to its ſurface. Thus let *a b*, and *c d*, (plate IX. *fig.* 7.) be the parallel ſurfaces, or boundaries of any medium whatſoever, ſuppoſe B *e* the direction of any projected body, entering it at *e*, and going out of it at F, or *f*, in the direction F D, or *f* H; alſo C F, and *f* G be perpendicular to *a b*, to *c d*, then will the angle C F D, or G *f* H be the angle of emergence.

If the projected body paſs through the medium as A E *f*, the ſine of the angle of emergence G *f* H will not always be equal to that of incidence, but in a conſtant ratio thereto. But when the direction of the projected body is ſuch, the points of incidence and emergence happen both on the ſame ſide of the fluid, or medium, as B *e* F D, then will the angle of emergence C F D always be equal to the angle of incidence. This is the caſe if a flat ſtone be thrown obliquely into the water, which will ſometimes dip and emerge ſeveral times, according to the velocity with which it is thrown, the figure of the ſtone, or the obliquity of its incidence.

Sir Iſaac Newton, in the XIVth Sect. of the firſt Chapter of his *Principia*, has given very elegant demonſtrations of the two preceding uſeful propoſitions, by conſidering the emerging mediums to conſiſt of particles that uniformly attract the emerged body in its paſſage through it, and from thence concludes the curve *e* F to be a parabola; he then ſhews how the firſt propoſition follows from the nature of that curve; and the ſecond he gathers from a propoſition founded upon the firſt, which is this. The velocity of the body before its incidence is to that after it has emerged, as the ſine of the angle of emergence is to that of incidence. From this propoſition he alſo deduces another, which is, that the motion before the emergency muſt be greater than after it, to cauſe the body to be reflected.

Hence the propoſition on which the whole ſcience of catoptrics is founded, viz. the equality of the angles of incidence and reflection, follows as a corollary, by ſuppoſing the depth, or way of emergence, to be infinitely ſmall; or that the body, or ray of light, is reflected from the point of incidence without entering the medium.

ANGLE *of the Epaule*, or *Shoulder*, in fortification, is the angle formed by the flank and the face of the baſtion; as the angle B C E (plate X. *fig.* 4.)

ANGLES *Equal* are ſuch as are meaſured by the ſame, or equal arcs of equal circles.

ANGLE *of Evection*. See EVECTION.

ANGLES *External*, are thoſe formed by any ſide of a right-lined figure, and its adjacent ſide produced. Thus the angle A B C (plate IX. *fig.* 9.) formed by the ſide A B, and its adjacent ſide D B, produced to C, is an external angle of the trapezium A B D E, *per* Euclid. B. I. Theo. 2. All the external angles of any right-lined figure taken together are equal to four right-angles; alſo *per* Prop. 32. B. I. the external angle in any triangle is equal to both the internal oppoſite ones.

ANGLE *Flanked*, the ſame with the angle of the baſtion, which ſee.

ANGLE *of the Flank*, is the angle formed by the flank and the curtain.

ANGLE *forming the Flank*, is that conſiſting of one flank, and one demi-gorge.

ANGLE *flanking Inward*, is the angle made by the flanking line with the curtain.

ANGLE *flanking Outward*, the ſame with ANGLE *of the tenaille*, which ſee.

ANGLES *Homologous*, in ſimilar figures, are ſuch as retain the ſame order, reckoning from the firſt in both figures. Thus in the ſimilar triangles, A B C, and *a b c*, (plate X. *fig.* 2, and 3.) the angles A and *a*, B and *b*, C and *c* are homologous angles. See SIMILAR FIGURES.

ANGLE *of Incidence*, in optics, is that which is contained between a ray of light incident on any reflecting ſurface, and a line drawn perpendicular to that ſurface. Thus the angle A C B, (plate IX. *fig.* 4.) comprehended between the incident ray A C, and perpendicular C B, is an angle of incidence.

ANGLES *Internal*, are thoſe made by the inclination of the two adjacent ſides of any right-lined figure within it; and their ſum, *per* Euclid. B. I. Theo. 1. in every right-lined figure whatſoever, is equal to twice as many right angles, abating four, as the figure hath ſides.

ANGLE *of Interval between two Places*, is that formed by two lines directed from the eye to thoſe places: ſuch is the angle B A C (*fig.* 10.)

ANGLE *of Longitude*, in aſtronomy, is the angle comprehended between the meridian and circle of longitude of the ſun, or a ſtar, at the pole of the ecliptic.

ANGLE *Lunular*, is an angle formed by the interſection of two curves, the one concave, and the other convex.

ANGLE (*the Meaſure of*) is the arc of a circle intercepted between the legs of the angle, and whoſe centre is in the angular point. Thus the meaſure of the angle B A C is the arc D E (plate VII. *fig.* 7.) comprehended between the legs A B and B C, and the number of degrees and minutes, &c, contained in that arc, is ſaid to be the meaſure or quantity of the angle B A C.

Hence it is very eaſy to meaſure the quantity of any angle geometrically; for, if you open the ſector until the points marked 60 in the line of chords be equal to the radius of the circle, or A E, and then taking the diſtance D E in your compaſſes, and try it backward or forward on the ſector, till the points of the compaſs fall both on the ſame number of degrees and minutes, you will have the true meaſure of the angle: or, it may be done otherwiſe, thus; apply the centre of a protractor to the angular point A, in ſuch manner that the leg A C, and radius of the protractor, perfectly coincide; then the degree on the limb of the protractor which is cut by the other leg A B, will ſhew the quantity of the angle which was required.

ANGLE, *mixed Line*, is that formed by a right line and a curved one.

ANGLE *of the Mote*, in fortification, is that which is made before the curtain where it is interſected.

ANGLES *Oblique*, are all thoſe which are either greater or leſs than a right angle.

ANGLES *Obtuſe*, are thoſe which are greater than a right angle.

ANGLE *of the Polygon*, is an angle formed by two lines drawn from the point of one baſtion to another; ſuch is the angle L B D (plate X. *fig.* 4.)

ANGLES *Rectilineal*, or right-lined, are thoſe whoſe legs are both right-lined; ſuch is the angle C A B, (plate VII. *fig.* 7.)

ANGLES *Re-entering*, in fortification, are thoſe whoſe angular points turn inwards, and legs open towards the field.

ANGLE *of Reflection*, is the angle B C D, (plate IX. *fig.* 4.) comprehended between the line of direction C D, which a body moves in after it has been reflected from the ſurface of another body E F G H, and a line B C, drawn perpendicular to the ſurface of that body, from the point of contact, C.

ANGLE *of Refraction*, in dioptrics, is the angle A C B (plate IX. *fig.* 5.) which a ray of light, C A, after it has been refracted through the medium D E F G, makes with the incident ray, ⊙ C, produced to B.

ANGLE *Refracted*, is the angle which a ray of light makes after it has been refracted with a line drawn perpendicular to the ſurface of the refracted medium. Thus let D E F G (*fig.* 5.) be the refracting medium contained between the parallel ſurfaces D E and F G, H C perpendicular thereto, and C A a ray of light after it has been refracted; then will the angle A C B be the refracted angle.

The ratio of the ſine of the angle of incidence to that of the refracted angle, hath by numberleſs experiments been found to be invariable in the ſame medium; but in different mediums it differs greatly. Sir Iſaac Newton, in his Optics, hath ſhewn that in glaſs it is nearly as 3 to 2; in rain-water nearly as 4 to 3; and in ſpirits of wine nearly as 10 to 7: it may likewiſe here be obſerved, that when the ray moves out of a rare into a denſer medium, the refracted angle is always leſs than the angle of incidence; and the contrary.

There have been many methods invented whereby the quantity, or law of refraction, may be obſerved: the following one, as it is not only the moſt eaſy, but as it alſo determines the law of refraction from air into glaſs, which is what is moſt wanted, we ſhall give as an example. Let *f* B E F (plate IX. *fig.* 11.) be a well poliſhed glaſs cube, ſtanding on a plain deal board, *a b c d*; at the end of which there is another *b c* H E fixed at right angles, having the ſame height with the ſide of the cube H F, and let their common breadth *b c* be greater than the ſide of the cube *b* H, and

and the length *d c* much longer than either; then let those boards with the cube fixed on them close to the perpendicular one *b* E H *c*, be turned toward the sun at different altitudes, and at every time note the shadow of the top of the perpendicular board, both within the cube at A, and without it at I; now, since FA is the refracted ray, and F I the unrefracted one, H F K will be the refracted angle, and H F I the angle of incidence; and if F H be supposed the radius, then will A H be the tangent of the refracted angle, and H I a tangent to that of incidence; and if H A and H I be carefully measured on an exact scale of equal parts at every different altitude, you will have their several ratios in numbers, from whence those of their sines may easily be had by trigonometry.

ANGLE *Right*, is that made by two right lines, or the planes of two circles, drawn or described perpendicular to each other; and its measure is always a quarter of a circle, or 90°.

ANGLE *Right-lined*, is that whose legs are both right lines, as the angle C A B (plate VII. *fig.* 7.).

ANGLES *Saliant*, in fortification, are such whose angular points turn outward; as the angles of the bastions, &c.

ANGLE *in a Segment*. See ANGLE *at the Circumference*.

ANGLE *of a Segment*, is the angle which a tangent makes with a chord line, drawn from the point of contact to any other point in the circle's periphery. Thus, let the right line A C (plate VIII. *fig.* 4.) be a tangent to the circle D B E in B; then if a chord, as D B, be drawn from the point of contact, the angles A B D and C B D are angles of a segment; and the measures of those angles are half the arcs B D and B E D respectively, A B D being equal to the angle B E D, *per* Euclid 32. 3. and so of the other.

Note, The angle A B D is called the angle of the lesser segment, and C B D that of the greater.

ANGLE *of a Semi-circle*, is that which the diameter of a circle makes with the circumference. Euclid and several others have given us the following paradox concerning this angle, viz. That it is less than a right angle, and yet greater than any acute right-lined angle whatsoever: the truth is, it is of much the same nature with the angle of contact, and, indeed, of equal use; which is none at all.

ANGLES *Similar*. See HOMOLOGOUS *Angles*.

ANGLE *Solid*, is the meeting of three or more lines in the same point, but not in the same plane. Thus a solid angle is formed where the two sides and cieling of a room meet, by the line which is the perpendicular or common section of the walls, and those lines which are the common sections of the two walls and the cieling: these three lines form a solid angle, consisting of three plane angles; and *per* Euclid, 20. 11. the sum of any two of those angles, howsoever taken, is greater than the remaining one; and *per* Prop. 21. the sum of the angles, how many soever they be, forming any solid angle, is less than four right angles, or 360°.

A perfect knowledge of the properties of solid angles will be found very useful by those who would form a right understanding of the nature of the five regular bodies.

ANGLE *Spherical*, is an angle formed on the surface of the sphere by the intersection of two great circles; or, as it is sometimes defined, the mutual inclinations of the planes of two great circles. Thus, let A D B E (plate IX. *fig.* 6.) represent a sphere; on the surface of which, let two arcs of great circles, as A B, and D E, be described, to intersect one another in C; then will A C D, D C B, B C E, and E D A, be spherical angles.

All spherical angles are measured on the arc of a great circle, described on the point of intersection C, as a pole, at the distance of 90°: and the sum of all the spherical angles which can be formed about a point are equal to four right angles, *per* Emerson's Trigonometry, b. 3. prop. 3.

ANGLE *of the Tenaille*, in fortification, is the angle made by the intersection of the two lines of defence before the curtain; such is the angle B I D (plate X. *fig.* 4.)

ANGLES *Vertical*, are the opposite angles formed by the intersection of two right lines, or the planes of two great circles. Thus of the former kind are the angles A D C, E D B (plate VII. *fig.* 6.) and of the latter, the angles A C D, E C B (plate IX. *fig.* 6.) each pair being said to be vertical, with respect to each other.

ANGLE *of Vision*, or *the optic Angle*, is the angle B A C, (plate IX. *fig.* 10.) formed at the eye by two rays A B, A C, coming from the extreme points of an object.

ANGLING, the art of fishing with a rod, to which are fitted a line, hook, and bait.

The following rules are necessary to be observed in angling. 1. To place yourself so that your shadow do not at any time fall upon the water, especially if it be shallow. 2. To angle in a pond near the ford where cattle go to drink, and in rivers, in such places as the fish you angle for usually frequent; as, for breams in the deepest water; for eels under banks; for chub in deep-shaded holes; for perch and roach in scowrs; for trouts in quick streams.

The best times for angling are from April to October; for in cold stormy weather, or bleak easterly winds, the fish will not bite. The time of the day, in warm months, is in the morning, about nine o' clock, and in the afternoon between three and four. In order to attract fish to the place intended for angling, it will be proper once in four or five days to throw in some corn boiled soft, garbage, worms chopped to pieces, or grains steeped in blood and dried; and, if you fish in a stream, it will be best to throw in the grains above the hook.

The best method of angling with a fly is down the stream; and, in order to make the fish bite freely, be sure to use such baits as you know they are naturally inclined to, and in such a manner as they are accustomed to receive them.

The several methods for angling for salmon, trout, carp, tench, perch, pike, dace, gudgeons, roach, flounders, &c. will be found under the articles *Salmon* FISHING, *Trout* FISHING, &c.

ANGLO-SAXON, a name given to the language spoken by the English Saxons, in order to distinguish it from the true Saxon, and also from the modern English.

ANGONÆUS, in anatomy, a name given to a muscle of the arm inserted into the ancon, or extremity of the elbow.

ANGUILLA, in natural history, the name by which the writers in that science call the eel. See EEL.

ANGUINA, in botany, a name used by different authors for two very distinct genuses of plants, called by Linnæus trichosanthes and calla. See the articles TRICHOSANTHES and CALLA.

ANGUINEAL *Hyperbola*. See HYPERBOLA.

ANGULAR, in a general sense, signifies something belonging to, or that hath angles. See the article ANGLE.

ANGULAR *Motion*, in astronomy, is the increasing or decreasing angle made by two lines drawn from a central body, as the sun or earth, to the apparent places of two planets in motion. The angular motions of a planet and the sun made in the same time, are reciprocally proportionable to their periodical times.

ANGULAR *Capital*. } See { CAPITAL.
ANGULAR *Column*. } See { COLUMN.
ANGULAR *Niche*. } See { NICHE.
ANGULAR *Section*. } See { SECTION.

ANGURIA, the water-melon, in botany, a genus of plants that produce male and female campaniform flowers; the male have three short filaments joined together; the female flowers rest upon an oviary supporting a cylindrical style, the oviary after becomes an oblong fleshy fruit, containing five cells filled with compressed seed. This plant is little raised in England, but cultivated greatly in the warm countries; and the fruit is much esteemed by the inhabitants for their cooling flavour: they are managed here like the musk melon, requiring more room to extend, and in some places produce tolerable fruit.

ANHELATIO, or ANHELITUS, among physicians, a shortness of breath, or a difficult and small, but quick, respiration, which happens to sound persons, especially to valetudinarians, after violent exercise.

The word is Latin, and derived from *anhelo*, to pant, and breathe with difficulty.

ANHIMA, in natural history, the name of a bird, common in Brazil, resembling a crane in some particulars; but differing from that and all other birds by a slender horn of a bony substance, inserted a little above the origin of its beak: its wings too have each a horn of this kind growing out of the fore-part of the bone. It is larger than a swan, and mottled with black, grey, and white; in some parts are small spots of yellow.

ANHINGA, in natural history, an extremely beautiful water-fowl, found in the Brazils, about the size of our common duck. Its beak is about an inch and an half in length, and has a row of hooked prickles both above and below; its neck is long and slender, and together with its head, of a yellowish colour; the upper part of the back is brown, spotted with yellow; and the breast, belly, and thighs, are of a silvery white.

ANIL, in botany, the Indian name for the indigo plant, called by Linnæus indigofera. See the article INDIGO.

ANIMA, the soul, or principle of life in animals. See the article SOUL.

ANIMA *Mundi*, the soul of the universe, is, according to some, a certain, pure, ætherial substance, which, being diffused through the whole mass of matter, informs, actuates, and unites the various parts of it into one great, perfect, organical body. Others define it to be an ignific virtue infused into the chaos, and disseminated through the whole frame for its conservation, nutrition, and vivification.

The moderns reject this notion of an anima mundi, as it is absolutely repugnant to experience.

ANIMADVERSION, a term sometimes used to signify correction, sometimes remarks, and sometimes serious consideration.

The word is Latin, *animadversio*, and compounded of *animus*, the mind, and *verto*, to turn.

ANIMAL, in natural history, an organized body, endowed with life and spontaneous motion.

Animals may be considered either as aerial, terrestrial, aquatic, or amphibious. We call those aerial which have wings, with which they can support themselves in the air.

Terrestrial are those whose only place of rest is upon earth. Aquatic are those whose constant abode is upon the water.

Those are called amphibious which live freely in the air, upon the earth, and yet are observed to live long on the water, as if they were natural inhabitants of that element.

Aerial animals may be subdivided into birds and flies. Fishes, which are the chief part of aquatic animals, may be divided into shell-fishes, scaly fishes, and those that have neither apparent scales nor shells.

And terrestrial animals may be divided into quadrupedes, or beasts; reptiles, which have

many feet; and ſerpents, which have no feet at all.

Inſects, which in their ſeveral changes belong to ſeveral of the before-mentioned diviſions, may be conſidered together as one great tribe of animals. They are called inſects, from a ſeparation in the middle of their bodies, whereby they are as it were cut into two parts, which are joined together by a ſmall ligature, as we ſee in waſps, common flies, and the like.

Beſides all theſe, there are ſome animals that are not perfectly of theſe kinds, but placed as it were in the middle betwixt them, by having ſomething of both; as beaſts and birds in them.

The greateſt part of animals have five ſenſes, viz. ſeeing, hearing, ſmelling, taſting, and feeling. Some reptiles of the earth, and ſome of the aquatics, want one or more of the ſenſes which are in perfect animals, as worms, oyſters, cockles, &c.

One would wonder to hear ſceptical men diſputing for the reaſon of animals, and telling us it is only our pride and prejudices that will not allow them the uſe of that faculty. Reaſon ſhews itſelf in all occurrences of life: whereas the brute makes no diſcovery of ſuch a talent, but in what immediately regards his own preſervation or the continuance of his ſpecies. Animals, in their generation, are wiſer than the ſons of men; but their wiſdom is confined to a few particulars, and lies in a very narrow compaſs. Take a brute out of his inſtinct, and you find him wholly deprived of underſtanding.

Animals conſiſt of ſolids, or firm parts, as fleſh, bones, membranes, &c. and fluids, as blood, &c.

The ſolids are mere earth, bound together by ſome oily humour; and accordingly are reducible by fire into ſuch earth again.

Thus a bone, being perfectly purged of its moiſture by calcination, is found a mere earth, which the leaſt force will crumble into duſt, for want of the natural gluten; yet the ſame bone, by immerging it in water or oil, becomes firm and ſtrong again, and more ſo in oil than water. And thus cupels will ſuſtain the utmoſt effects of fire.

The parts of animals are diſtinguiſhed from thoſe of vegetables by two circumſtances: the firſt, that when burnt they are found perfectly inſipid, all animal ſalts being volatile, and flying off with heat; the contrary of this is found in vegetables, which conſtantly retain ſome fixed ſalt in all their aſhes.

The ſecond, that no true acid is contained in any animal juice; nor can any acid ſalt be extracted from the ſame; the contrary of which is found in all vegetables.

Yet are animals reconverted into their vegetable nature by putrefaction.

Animals make the ſubject of that branch of natural hiſtory called zoology.

The ſtructure of animals, with their diſorders, remedies, &c. make the ſubject of anatomy, medicine, &c.

As to the ſtructure of animals, it is obſerved that the make of every kind of animal is different from every other kind; and yet there is not the leaſt turn in the muſcles or twiſt in the fibres of any one which does not render them more proper for that particular animal's way of life, than any other caſt or texture of them would have been.

ANIMAL, uſed adjectively, ſignifies ſomething belonging to, or partaking of, the nature of animals.

ANIMAL *Oeconomy*. See OECONOMY.

ANIMAL *Oil*. See the article OIL.

ANIMAL *Secretion*, the ſeparation of the ſeveral juices of the body from the blood. See SECRETION.

ANIMAL *Spirits*, a very ſubtile fluid, ſuppoſed to be ſeparated from the brain, and thence diffuſed into all parts of the body for the performance of all animal and vital functions. See the article SPIRIT.

ANIMALCULE, a minute animal, ſcarce, if at all, viſible to the naked eye.

The word is Latin, *animalculum*, a diminutive of animal.

Animalcules, though ſo very minute as to be only ſeen by the aſſiſtance of the microſcope, are vaſtly more numerous than any other part of the animal creation. They have been diſcovered in moſt liquors, in ſeveral of the chalybeat as well as in common water; in oats, barley, wheat, peas, &c. and in the puſtules of the itch.

ANIMATED, ſomething inſpired with life, or that exhibits marks of being inſpired by ſome ſpirit or ſoul.

ANIMATED *Mercury*, a term made uſe of by Mr. Boyle to denote mercury impregnated with ſpirituous particles, which when mixed with gold grows hot.

ANIMATED *Needle*, one that is touched with a magnet, or loadſtone. See NEEDLE and MAGNET.

ANIMATED *Power*, in mechanics, ſignifies that the power made uſe of is a man, horſe, or ſome animal, in oppoſition to weights, &c.

ANIME, or *Gum* ANIME, in natural hiſtory, is a kind of gum, or rather reſin, of a friable ſubſtance, inflammable, and ſoluble in oil. There are two kinds of this gum-reſin, diſtinguiſhed by the epithets of oriental and occidental.

The oriental or Ethiopian anime, is a dry and ſolid reſin, brought to us in large cakes or maſſes, of an irregular figure, and of a very uncertain colour; ſome of them are greeniſh, ſome reddiſh, ſome brown, and ſome of the colour of myrrh; they all agree in this, however, that they are moderately pellucid, of a tolerable compact texture,

ture, light and eaſily powdered, of a fragrant ſmell, very inflammable, and of a reſinous and ſomewhat bitter taſte. This, which is the genuine and true anime, is now very rare in the ſhops.

The occidental anime is a whitiſh, dry, and ſolid reſin, ſomewhat reſembling frankincenſe in colour. It is often of a fine yelloviſh white, between that of frankincenſe and maſtich, and in the pureſt pieces is very clean and tranſparent; in general, however, it is much inferior to the oriental in theſe reſpects. It is moderately heavy, friable, and ſomewhat oleaginous to the touch. It is exttemely fragrant, eſpecially when burnt, and is of a reſinous, acrid, and ſomewhat bitteriſh taſte. It is brought to us from many parts of America, particularly from New Spain and the Braſils. The natives call it joticacica and jetaicica. Our people, from their name of the tree, vulgarly call it reſin of courbaril.

ANIME, in heraldry, a term uſed when the eyes of any rapacious creature are borne of a different tincture from that of the creature itſelf.

ANINGA, in commerce, the name of a root growing in the Antilles iſlands, nearly reſembling the china root. It is uſed in the ſugar works for refining the ſugar.

ANISUM, or ANISE, in botany, a ſmall annual umbelliferous herb, which produces flowers and ſeeds in July. It is cultivated in Germany; but the beſt ſeed, which is the ſmaller ſorts, comes from Spain. The ſeeds to be good ſhould be freſh, plump, free from mouldineſs, accompanied with a very ſtrong aromatic ſmell; they are in common uſe as a warm carminative, and good to expel wind out of the bowels and ſtomach, and are uſed by confectioners in ſugar-plumbs of various denominations. By diſtillation an oil may be extracted from anniſeeds, which ariſes with the water in a conſiderable quantity: this oil is of a yelloviſh colour, and congeals into a butyraceous white concrete; its ſmell, which exactly reſembles that of the ſeeds, is extremely durable and diffuſive, and its taſte milder and leſs pungent than almoſt any other diſtilled vegetable oil.

Another ſort of aniſe, called by ſome botanical authors aniſe ſtellatum, is the fruit, or ſeed-veſſel, of a ſmall tree, growing in Tartary, China, and the Philippine Iſlands, but is little, if at all uſed in pharmacy. The common aniſe in the Linnæan ſyſtem is claſſed as a ſpecies of the pimpinella. See PIMPINELLA.

ANKER, a liquid meaſure at Amſterdam, containing about thirty-two gallons Engliſh.

ANNALES, a ſpecies of hiſtory, wherein events are related in the chronological order they happened.

It differs from a perfect hiſtory, in being only a meer relation of what paſſes every year, as a journal is of what paſſes every day; whereas hiſtory relates not only the tranſactions themſelves, but alſo the cauſes, motives, and ſprings of ſuch actions. Annales require brevity only; hiſtory demands ornament.

Cicero informs us that the pontifex maximus, in order to preſerve the memory of events, wrote what paſſed each year on tablets, which were expoſed to public inſpection in his own houſe. Theſe tablets were called *annales maximi*; and hence the writers who imitated this ſimple method of writing were ſtiled annaliſts.

ANNATES, among eccleſiaſtical writers, implies the firſt year's revenue of a ſpiritual living.

Theſe annates were formerly given to the pope; but at the Reformation they were veſted in the king. Queen Anne, however, reſtored them to the church, by appropriating them to the augmentation of ſmall livings.

ANNEALING, or NEALING, an operation performed on glaſs, earthen-ware, &c. in a particular oven or furnace erected for that purpoſe: See the article NEALING.

ANNEALING *of Glaſs, Iron, Steel, &c.* See GLASS, IRON, STEEL, &c.

ANNE, or *St.* ANNE's *Day*, a feſtival obſerved in the Greek and Latin churches, in honour of Anne or Anna, mother of the Virgin Mary. It is celebrated by the former on the ninth of December, and by the latter on the twenty-ſixth of July.

ANNEXATION, in law, implies the uniting lands or rents to the crown.

ANNI *Nubiles*, in law, ſignifies the marriageable age of a woman, viz. after ſhe has reached her twelfth year.

ANNIENTED, in law, imports annulled or made void.

ANNIHILATION, the act of reducing any created being to nothing, and ſtands oppoſed to creation. The word is formed from the Latin, *ad*, to, and *nihilum*, nothing.

ANNIVERSARY, the annual return of any remarkable day.

The word is formed from the Latin, *annus*, a year, and *verto*, to turn.

Formerly anniverſary days particularly denoted thoſe days on which an office was performed for the ſouls of the deceaſed, or the martyrdom of the ſaints was celebrated in the church.

ANNO DOMINI, the year of our Lord, the computation of time from our Saviour's incarnation. See EPOCHA.

ANNOMINATION, in rhetoric; ſee PARONOMASIA.

ANNONA, in botany, the cuſtard apple, a genus of trees that grows in ſeveral places of the Weſt-Indies, whoſe fruit are in great eſteem in thoſe parts, either to pleaſe the palate, or by way of medicine: one of the ſorts grows in plenty in the

the Bahama islands, which is called by the inhabitants papaw, and will thrive in the open air in England.

ANONIS, rest-harrow, in botany. See ONONIS.

ANNOTATION, in matters of literature, a brief commentary, or remark on a book or writing, in order to clear up some passage, or draw some conclusion from it.

ANNOTATION, among physicians, implies the beginning of a febrile paroxysm, when the patient begins to shiver, yawn, and stretch.

ANNOTTO, in dying, an elegant red colour, formed from the pellicles of the seeds of a tree common in South-America. It is also called orlean, and roucou.

The manner of making annotto is as follows: The red seeds, cleared from the pods, are steeped in water for seven or eight days or longer, till the liquor begins to ferment; then strongly stirred, stamped with wooden paddles and beaters, to promote the separation of the red skins: this process is repeated several times till the seeds are left white. The liquor, passed through close cane sieves, is pretty thick, of a deep red colour, and a very ill smell: in boiling, it throws up its colouring matter to the surface in form of scum, which is afterwards boiled down by itself to a due consistence, and made up while soft into balls.

The annotto, commonly met with among us, is moderately hard and dry, of a brown colour on the outside, and a dull red within. It is with difficultly acted upon by water, and tinges the liquor only of a pale browniſh yellow colour. In rectified spirit of wine, it very readily dissolves, and communicates a high orange or yellowish red. Hence it is used as an ingredient in varnishes, for giving more or less of an orange cast to the simple yellows. Alkaline salts render it perfectly soluble in boiling water, without altering its colour. Wool or silk boiled in the solution, acquires a deep, but not a very durable, orange dye. Its colour is not changed by alum or by acids, any more than by alkalies; but when imbibed in cloth, it is discharged by soap, and destroyed by exposure to the air.

ANNUA *Persione*, in law, an old writ for granting an annual pension to one of the king's chaplains.

ANNUAL *Motion of the Earth*. See EARTH.

ANNUAL *Equation*, in astronomy. See EQUATION.

ANNUAL *Argument* of longitude. See ARGUMENT.

ANNUAL *Epact*. See EPACT.

ANNUITY, a yearly rent or revenue, paid either for term of life, or of years, or in fee, and for ever.

In common law, the difference between a rent and an annuity consists in this, that rent is payable out of land; whereas an annuity charges only the person of the grantor; and that, for the recovery of a rent, an action lies: whereas for that of an annuity, there only lies a writ of annuity against the grantor, his heirs and successors. Add, that annuities are never taken for assets, as being no freeholds in law.

For the computation of the value of annuities in arrears on lives, in perpetuity, &c. See INTEREST *and* PROGRESSION.

ANNULAR, in a general sense, implies something in the form of a ring.

The word is formed from the Latin, *annularis*, and derived from *annulus*, a ring.

ANNULAR, in anatomy, is an epithet applied to several parts of the human body; thus the second cartilage of the larynx is called the annular cartilage; the ligament that encompasses the wrist, and ties the bones together, is termed the annular ligament; and a protuberance of the medulla oblongata is stiled the annular process.

ANNULAR is also a peculiar name for the fourth finger.

ANNULETS, in architecture, a small square member in the Doric capital, under the quarter round, sometimes called a fillet, listel, or cincture, rabbit, square, eye-brow, and tinea. It is also a narrow, flat moulding, common to divers places of the columns, as in the base, capitals, &c.

ANNULET, in heraldry, is a mark of distinction proper to the fifth brother of a family.

ANNULLING, a term sometimes used for cancelling, or rendering a deed, sentence, &c. void, and of no effect.

ANNUNCIADA, an order of knighthood in Savoy, originally instituted by Amadeus I. in the year 1409, and called by the founder, the knot of love. The collar consisted of fifteen links interwoven with one another, in the form of a true lover's knot; and the motto F. E. R. T. *fortitudo ejus Rhodum tenuit*. But Amadeus VIII. changed the name to that of Annunciada, and instead of the image of St. Maurice, which was appended to the collar, placed that of the Virgin Mary. At the same time he substituted the words of the angel's salutation, instead of those in the above motto.

ANNUNCIADES, several religious orders instituted in honour of the annunciation.

The first order of this kind was founded by seven merchants at Florence, 1232. The second was a nunnery at Bourges, founded by Joan, queen of France, after her divorce from Lewis XII. The third was a nunnery founded by a Genoese lady in the year 1600. The fourth a friary, founded by cardinal Torrecremata, at Rome.

ANNUNCIATION, a festival celebrated by the church on the twenty-fifth of March, in memory of the annunciation, or tidings, brought by

the angel Gabriel to the Virgin Mary, of the incarnation of Chriſt.

The feaſt of this annunciation appears to be of very great antiquity. There is mention made of it in a ſermon, which goes under the name of Athanaſius. Others carry it up to the time of Gregory Thaumaturgus, becauſe there is a ſermon likewiſe attributed to him upon the ſame ſubject. But the beſt critics reject both theſe writings as ſpurious. However, it is certain, this feſtival was obſerved before the time of the council of Trullo, in which there is a canon forbidding the celebration of all feſtivals in Lent, excepting the Lord's-day, and the feaſt of the annunciation: ſo that we may date its original from the ſeventh century.

ANODYNE, among phyſicians, ſignifies a medicine that mitigates or removes pain.

The word is compounded of the Greek α, priv. and ὠδύνη, pain.

There are two ſpecies of anodynes, diſtinguiſhed by the epithets proper and improper. The former are ſuch as mitigate the pain by removing the cauſe. The latter that alleviate it for a time by ſtupifying the ſenſes. The proper anodynes are called paregorics; and the improper opiates, and narcotics. See the articles PAREGORICS, OPIATES, and NARCOTICS.

ANOMALISTICAL *Year*, in aſtronomy, is the time which the earth takes in paſſing through its orbit, and is moſtly called the periodical year; for the ſpace of time belonging to this year is greater than the tropical year, on account of the preceſſion of the equinoxes. See PRECESSION.

ANOMALOUS, in a general ſenſe, is applied to whatever is unequal, irregular, or that deviates from the rule obſerved by ſimilar things in ſimilar caſes.

The word is formed from the Greek, α, priv. and ὁμαλὸς, equal.

ANOMALOUS *Pulſe*, among phyſicians, implies a pulſe whoſe ſtrokes are unequal with regard to ſtrength.

ANOMALOUS *Verbs*, in grammar, are ſuch as are irregularly conjugated, or formed in a manner different from the general rules.

ANOMALY, in grammar, implies an irregularity or a deviation from the common rules.

ANOMALY in aſtronomy, is an irregularity in the motion of the planets, whereby they deviate from the aphelion or apogee, which irregularity or inequality is called either *mean*, *eccentric*, and *coequate*, or *true anomaly*.

Excentric ANOMALY, or ANOMALY *of the Centre*, in the new aſtronomy, is an arch of an eccentric circle, AEMGP (plate X. *fig.* 1) terminated by AP, and by the line D *p* E drawn through the center of the planet *p* (which is ſuppoſed to be its place in the elliptic orbit A *p* H P) perpendicular to AP; but in the old aſtronomy is an arch of the zodiac, terminated by the lines of the apſides, and the line of the mean motion of the center.

Mean ANOMALY, in the new elliptical aſtronomy, is the area contained under the line S *p*, drawn from the ſun, which is ſuppoſed to be in the focus of the ellipſe A *p* H P to the planet in its orbit at *p*, and under the line A S and A *p*; but in the old aſtronomy is an arc of the ecliptic, between its mean place and apogee.

True or coequate ANOMALY, is the diſtance of the ſun from its apogæum, or of a planet from its aphelium; or it is repreſented by the angle A S *p*, when the planet comes from A to *p*, but when the motion of the planet is reckoned from the vernal interſection of the equator and the ecliptic, or from the beginning of Aries, it is called the motion in longitude, which is either a mean motion, ſuch as the planet would have, did it move uniformly in a circle round the ſun; or elſe the true motion wherewith the planet deſcribes its orbit, and is reckoned by the arch of the ecliptic it is ſeen to deſcribe; which true motion is ſometimes accelerated and ſometimes retarded, according to the diſtance of the planet from the ſun in the various points of its orbit.

Therefore at any given time after the planet has left its aphelion, we find out its place in its orbit by dividing the area of the ellipſe A *p* H P by the line S *p*, ſo that the whole elliptic area may have the ſame proportion to the area A S *p*, as the whole periodical time wherein the planet deſcribes its orbit is to the time given: there has been many methods given to divide an ellipſe in this manner by Geometricians, which is finding the difference between the true and mean anomaly, or in other words to ſolve the famous Keplerean problem. Sir Iſaac Newton having demonſtrated that this problem cannot be ſolved in finite terms, recourſe has therefore been had to approximations: the following method which we preſume has the advantage of every other, as well in point of accuracy as expedition, was given by that ingenious aſtronomer and mathematician Mr. George Witchel, in the Mathematical Magazine, Numb. I.

SOLUTION.

Let the ſemi-circle A G P be deſcribed upon the tranverſe axis A C P, and through *p*, the place of the planet, let D *p* E be drawn, parallel to the ſemi-conjugate H C, meeting the ſemi-circle in the point E; join E, S, and the ſemi-circle will be divided by the line E S, in the ſame ratio, as the ſemi-ellipſe A H P is by the line *p* S, as is demonſtrated by the writers on conics; let E, C, be joined, upon which, produced if needful, let fall from S, the perpendicular S F; take the arc E M equal in length to the right-line S F, and join M, C: Then it is evident, that the area of the ſector E C M, will be equal to the area of the triangle E C S,

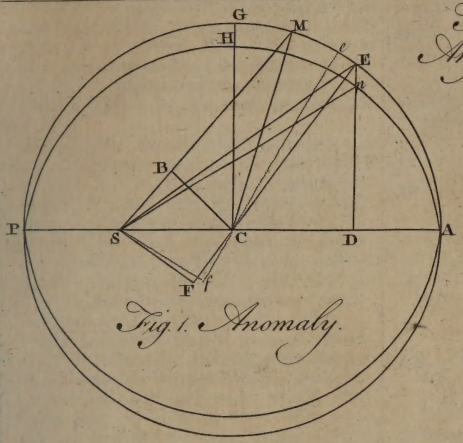


Fig. 1. Anomaly.

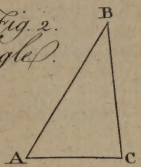


Fig. 2. Angle.

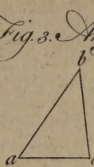


Fig. 3. Angle.

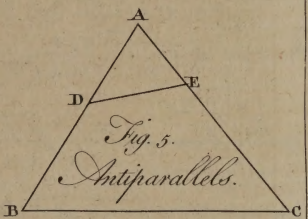


Fig. 5. Antiparallels.

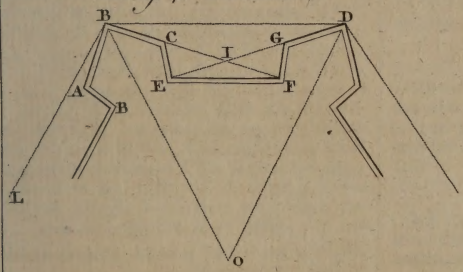


Fig. 4. Bastion.

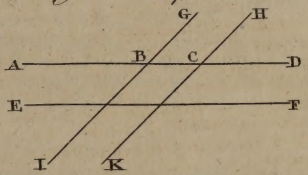


Fig. 6. Antiparallels.

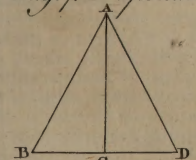


Fig. 7. Apotome.

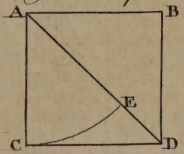


Fig. 8. Apotome.

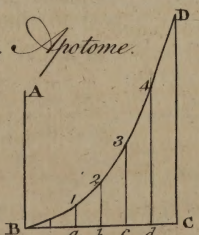


Fig. 9. Apotome.

J. Lodge Sculp.

ECS, and consequently, the area of the sector ACM, will be equal to the trilinear area ASE: Hence the sector AMC, or the angle ACM, will be proportional to the elliptic area A p S, which is called the mean anomaly of the planet, as the angle ACE, is denominated the excentric anomaly, and the angle A S p, the true, or co-equate anomaly.

In order to find the excentric anomaly, and from thence the true anomaly, let the angle ACM be taken equal to the given mean anomaly; join M, C, and M, S; and upon the right-line MS, let fall from C, the center of the semi-circle, the perpendicular CB, which will, when the excentricity CS is but small in respect to AC, be very nearly equal to the right-line SF, or the arc ME; that is, to the difference between the mean and excentric anomalies: Take the arc M e, equal in length to the right-line CB, join e, C, upon which produced, if necessary, let fall the perpendicular S f; then if the arc M e be increased, and the right-line S f diminished in the ratio of eC to C f, until they become equal to each other, they will then become equal to ME and SF respectively, without sensible error, even in Mercury's orbit; whence the following method of solution is evident.

In the triangle MCS, there is given the two sides MC, the radius of the semi-circle, and CS, the excentricity, with the included angle MCS, the complement of the mean anomaly to two right-angles; whence the angle CMS will become known: Then, in the right angled triangle MCB, there will be given, the angle last found, together with, the side MC, whence, CB also becomes known; but CB, is equal to the arc M e, which measures the angle MC e: This angle being taken from the mean anomaly ACM, leaves the angle AC e, equal to the angle SC f; whence in the right-angled triangle C fS there are known, the side CS, and the angle SC f, by which, S f and C f will be found: Then is $M e + eC \times \frac{Sf - Me}{eC + Cf} = ME$ extremely near; but ME is the measure of the angle MCE, which is the difference of the mean and excentric anomalies; and, consequently, the excentric anomaly will become known.

The excentric anomaly being thus found, the true anomaly, or angle AS p, together with the line S p, or the planets distance from the sun, may be easily obtained by the two analogies given by M. de la Caille, in his Elements of Astronomy; of which, it may not be improper to subjoin the following demonstrations, though somewhat different from his.

Analogy I.

As the square-root of the aphelial distance SA, is to the square-root of the perihelial distance SP, so is the tangent of half the excentric anomaly, to the tangent of half the true anomaly.

Demonstration.

Let the radius of the semi-circle AC = 1, CS = e, and the tangent of half the excentric anomaly = t; then, by trigonometry, we shall have $1+e : 1-e :: t : \frac{1-e \times t}{1+e}$; and therefore $\frac{\frac{t+1-e\times t}{1+e}}{1-\frac{1-e\times t^2}{1+e}}$ = the tangent of ASE = $\frac{2t}{1+e-1-e\times t^2}$: And per conics, GC (1) : HC $(\sqrt{1-e^2})$ :: ED : PD :: $\frac{2t}{1+e-1-e\times t^2} : \frac{2t\sqrt{1-e^2}}{1+e-1-e\times t^2}$ = the tangent of

$$ASp = \frac{2\sqrt{1+e}\times\sqrt{-e\times t}}{1+e-1-e\times t^2} = \frac{2\times\frac{\sqrt{1-e\times t}}{\sqrt{1+e}}}{1-\frac{1-e\times t^2}{1+e}} =$$

the tangent of $\frac{1}{2}$ ASp + $\frac{1}{2}$ ASp; and, therefore, $\frac{\sqrt{1-e\times t}}{\sqrt{1+e}}$ = the tangent of $\frac{1}{2}$ ASP, which resolved into an analogy becomes $\sqrt{1+e} : \sqrt{1-e} :: t :$ tangent of $\frac{1}{2}$ ASP.

Q. E. D.

Analogy II.

As the sine of half the true anomaly, is to the sine of half the excentric anomaly; so is the square-root of the perihelial distance SP, to the square-root of S p, the distance of the planet from the sun.

Demonstration.

Let ε represent the excentric anomaly, and α the true, the rest of the symbols denoting the same as before; then from what has been proved above, we have the tangent of $\frac{1}{2}\alpha = \frac{\sqrt{1-e\times t}}{\sqrt{1+e}} =$

$\frac{\text{sin. } \frac{1}{2}\varepsilon \times \sqrt{1-e}}{\text{co-s. } \frac{1}{2}\varepsilon \times \sqrt{1+e}} = \frac{\text{sin. } \frac{1}{2}\alpha}{\text{co-s. } \frac{1}{2}\alpha}$; whence,

$\frac{\text{co-s. } \frac{1}{2}\varepsilon \times \sqrt{1+e}}{\text{co-s. } \frac{1}{2}\alpha} = \frac{\text{sin. } \frac{1}{2}\varepsilon \times \sqrt{1-e}}{\text{sin. } \frac{1}{2}\alpha}$; and per conics, GC (1) : HC $(\sqrt{1-e^2})$ :: ED (sin ε) : pD = sin. $\varepsilon \times \sqrt{1-e^2}$ = sin. $\varepsilon \times \sqrt{1+e}\times\sqrt{1-e}$; but, by trigonometry, we have, sin. α : sin. $\varepsilon \times \sqrt{1+e}\times\sqrt{1-e}$ :: 1 : $\frac{\text{sin. } \varepsilon \times \sqrt{1+e}\times\sqrt{1-e}}{\text{sin. } \alpha}$ = S p, in which expression, instead of sin. α and sin.

$\sin.\ \varepsilon$, substituting their equals, $2 \times \sin.\ \frac{1}{2}\alpha \times \text{co-s.}\ \frac{1}{2}\alpha$, and $2 \times \sin.\ \frac{1}{2}\varepsilon \times \text{co-s.}\ \frac{1}{2}\varepsilon$, we get $Sp = \frac{\sin.\ \frac{1}{2}\varepsilon \times \text{co-s.}\ \frac{1}{2}\varepsilon \times \sqrt{1+e} \times \sqrt{1-e}}{\sin.\ \frac{1}{2}\alpha \times \text{co-s.}\ \frac{1}{2}\alpha}$

$= \frac{\sin.\ \frac{1}{2}\varepsilon)^2 \times 1-e}{\sin.\ \frac{1}{2}\alpha^2}$ (by writing for $\frac{\text{co-s.}\ \frac{1}{2}\varepsilon \times \sqrt{1+e}}{\text{co-s.}\ \frac{1}{2}\alpha}$

its equal $\frac{\sin.\ \frac{1}{2}\varepsilon \times \sqrt{1-e}}{\sin.\ \frac{1}{2}\alpha}$) and consequently

$\frac{\sin.\ \frac{1}{2}\varepsilon \times \sqrt{1-e}}{\sin.\ \frac{1}{2}\alpha} = \sqrt{Sp}$; therefore $\sin.\ \frac{1}{2}\alpha : \sin.\ \frac{1}{2}\varepsilon :: \sqrt{1-e} : \sqrt{Sp}$. Q. E. D.

I shall now reduce what has been said into the following practical rule, and then proceed to give some examples of its utility.

Practical Rule.

It will be most convenient to have the excentricity expressed in decimal parts of the semi-transverse axis: that done, from the log. of the perihelial distance, subtract the log. of the aphelial distance, and let the remainder be called A; likewise to the log. of the excentricity add the log. 1.758123 (being the log. of the number of degrees contained in an arc equal to the radius) and call the sum B; to the log. A, add the log. tangent of half the mean anomaly, and the sum will be the log. tangent of an arc; subtract this arc from half the mean anomaly, and to the log. sine of the remainder add the log. 1.758123, and the sum will be the log of the difference of the mean and excentric anomalies, very nearly: then if the mean anomaly be less than 180°, subtract this difference therefrom, otherwise add it thereto, and it will give the first value of the excentric anomaly, which will be sufficiently exact in each of the planets, except Mars and Mercury: in the former the error, when greatest, will be about three-fourths of a second; but in the latter, it will amount to one-third of a minute: in order therefore, to correct it, let the log. sine of the excentric anomaly, as found above, be added to the log. B, and the sum will be the log. of the difference of the two anomalies to a still greater exactness: then, if to the log. co-sine of the excentric anomaly, there be added the log. of the excentricity, the sum will be the log. of a fraction, which, if the excentric anomaly is more than 270°, or less than 90°, must be added to unity, otherwise subtracted therefrom, and the sum, or difference, will be a number, by which if the difference of the two values of the excentric anomaly be divided, the quotient will be the error of the first value of the excentric anomaly: then if the excentric anomaly is in the first or third quadrant, let the error be subtracted therefrom, otherwise added thereto, and it will give the excentric anomaly to a very great degree of exactness: lastly, to the log. tangent of half the excentric anomaly add half the log. of A, and the sum is the log. tangent of half the true anomaly.

Example I.

In the orbit of Mercury whose excentricity is 0,20589, when the mean distance is unity, it is required to find the excentric anomaly, and from thence the true, together with the distance of the planet from the sun, corresponding to the mean anomaly 130°,216181.

From the log. of the perihelial distance	0,79411	-	9.8998807
Subt. the log. of the aphelial distance	1,20589	-	0.0813077
And there remains the log. A.			9.8185730
Half the log. A. - - - - -			9.9092865
To the log. of the excentricity	0,20589	-	9.3136353
Add the log. of the radial arc	- - - -		1.7581226
And the sum is the log B.	- - - -		1.0717579
These logarithms, when once found, will be constant logarithms in each orbit.			
To the log. A. - - - -			9.8185730
Add the log. tang. of half the mean anom.	65,108090	-	10.3334699
And the sum is the long. tang. of	54,830575	-	10.1520429
The log. sine of the difference	10,277515	is	9.2514339
The log. of the radial arc, add	- -	-	1.7581226
The log. of - -	10,222486	-	1.0095565
Which, because the mean anom. 130,216181 is less than 180°, is to be subtracted therefrom.			
Difference, or first value of the excentric anomaly	119,993695.		
The log. sine of which is	- -	-	9.9375582
The log. B, add - - - -		-	1.0717579
The log. of - -	10,216830	-	1.0093161
Mean anomaly -	130,216181		
Difference, or second value of the excentric anom.	119,999351		
The log. co-sine of the first value of the excentric anomaly	119,993695	is	9.6988872

The log. of the excentricity	0,20589	add 9.3136353
The log. of the fraction	0,102925	- 9.0125225
Which, becauſe the excentric anomaly is more than 90° and leſs than 270°, muſt be ſubtracted from unity, and there remains 0,897075; the log. of which is		9.9528288
Which taken from the log. of 0,005656 the difference of the two values of the excentric anomaly, which is - - - - -		7.7525094
There remains the log. of the error 0,006305 - - - - -		7.7996806

Which according to the rule being added to the firſt value of the excentric anomaly, will give the true value thereof, viz. 120°,000000.

Then to the log. tang. of half the excentric anomaly - - -	60°,000000	- 10.2385606
Adding half the log. of A - - - -	- - - -	9.9092865
We have the log. tang. of half the true anomaly	54°,5695202	- 10.1478471
Therefore the true anomaly is -	109°,1390404 = 109°8′20″,55	
To the log. ſine of half the excentric anomaly - -	60°,0000 - - -	9.937530
Add the log. of the ſquare-root of the perihelial diſtance	- - - -	9.949940
And from the ſum of the logarithms	- - - -	9.887470
Subtract the log. ſine of half the true anomaly -	54°,5695 - -	9.911061
And there remains the logarithm -	- - - -	9.976409
Which multiplied by 2, gives the log. of the true diſtance of Mercury from the ſun	0,89705 - -	9.952818

In the preceding example the error is a maximum in this orbit, and amounts to no more than $\frac{1}{317}$ part of a ſecond; but as there is no neceſſity for this great accuracy, we may abridge the operation in ſome meaſure, and yet obtain the concluſion ſufficiently exact for real uſe: thus, if we proceeded no farther than the ſecond value of the excentric anomaly, in this example we ſhould not err above two ſeconds; but if this be thought too much, let the difference of the two values of the excentric anomaly 0,0057, taken only to four places of decimals, be divided by 0,9, inſtead of 0,897075, and the error will be but $\frac{1}{10}$ of a ſecond.

Example II.

Let the excentric anomaly of Mars be required, when the mean anomaly is 64°,59175.

In this orbit the excentricity is 0,09254, and the log. thereof 8.996323; the log. A is 9.919391, and the log. B. 0.724446: Then

To the log. A - - - - - - -		9.919391
Add the log. tang. of half the mean anomaly - -	32°,2959 - -	9.800767
And the ſum is the log. tang. of -	27°,6994 - -	9.720158
Difference - - -	4,5965	ſine 8.903838
Log. of the radical arc, add - -	- - - - -	1.758123
The ſum is the log. of - -	4°,5916 - -	0.661961
Which, according to the rule, muſt be ſubtracted from the mean anomaly - -	64°,5917½	
And there remains the firſt value of the excent. anom.	60°,0001½; which differs from the truth only by 0,0001½,	

or half a ſecond; but if the ſecond value thereof be found, the error will become too inconſiderable to be regarded. As all the other planets have their excentricities much ſmaller, the firſt value of the excentric anomaly, in each of them, will be ſufficiently exact, without further trouble.

I ſhall now conclude with the following Table, which exhibits all the conſtant logarithms for each of the planetary orbits:

Planets.	Excentricities, the mean diſt. being unity	Logarithms of the excentricities	The logarithm A	The logarithm B.	Log. of the ſquare-root of the perihelial diſt.
Saturn	0,05700	8.755875	9.950434	0.514011	9.987256
Jupiter	0,04821	8.683157	9.958085	0.441280	9.989271
Mars	0,09254	8.966323	9.919391	0.724446	9.978914
Earth	0,01681	8.225568	9.985398	9.983691	9.996319
Venus	0,00698	7.843953	9.993936	9.602076	9.998479
Mercu.	0,20589	9.315635	9.818573	1.071758	9.949940
Moon	0,05505	8.740757	9.952136	0.498880	9.987704

ANOMOEANS, in eccleſiaſtical hiſtory, the name by which the pure Arians were diſtinguiſhed in the fourth century, in contradiſtinction to the Semi-Arians.

The word is formed from the Greek, ἀνομοῖος, different, diſſimilar: for the pure Arians aſſerted, that the ſon was of a nature different from, and in nothing like, that of the father: whereas the Semi-Arians acknowledged a likeneſs of nature

in the ſon; at the ſame time that they denied, with the pure Arians, the conſubſtantiality of the word.

The Semi-Arians condemned the Anomœans in the council of Seleucia, and the Anomœans in their turn condemned the Semi-Arians in the councils of Conſtantinople and Antioch, eraſing the word ομοῖος, like, out of the Formula of Rimini, and that of Conſtantinople.

ANONYMOUS, ſomething without a name.

The word is Greek, ανωνυμος, and compounded of α, priv. and ονομα, a name.

It is generally applied to ſuch books as are publiſhed without the name of the author; and to ſuch authors whoſe names are unknown.

ANOREXY, among phyſicians, implies a want of appetite, or a loathing of food.

The word is Greek, ανορεξια, and compounded of α, priv. and ορεγομαι, to covet or deſire.

The anorexy is either an eſſential diſeaſe, proceeding from a fault in the ſtomach, or derived from other diſorders. When it is an original diſeaſe, it generally proceeds from a voraciouſneſs, and a hard diet; whence crude and undigeſted humours will ariſe and prevent digeſtion; which is often known from a ſenſe of weight in the ſtomach, or from copious wind and eructations of various kinds, chiefly the nidorous and acid; or from a nauſea and reaching to vomit. In old perſons, when the whole body is feeble, it may proceed from want of ſpirits, or the fluids being defective, or from a debility of the contractive force and motions of the ſtomach, whence an univerſal decay proceeds.

This diſorder is often a ſymptom of other diſeaſes, particularly the acute, as inflammations, aſthma, dropſy, hypochondriac paſſion, melancholy, the gout, vomiting, or dyſentery; or when the humours are ſo corrupt, and the ſpirits ſo oppreſſed in malignant diſeaſes, that the faculty of digeſtion is depraved, or nature may be ſo buſied in expelling another diſeaſe, as to neglect this. In the laſt caſe it cannot be cured till the diſeaſe itſelf is vanquiſhed.

In the ſpontaneous anorexy, when the ſtomach is loaded with crudities, which cauſe a reaching to vomit, a ſingle emetic will often perform a cure, joined to a ſtomachic remedy: but if there is no reaching, the humours are to be incided and digeſted with bitter ſalts, ſuch as the ſalts of bitter herbs, tartar vitriolated, arcanum duplicatum, or the like, given in powder from a ſcruple to half a dram, ſeveral times in a day; or terra foliata tartari diſſolved, to ſixty drops or more. After this the cathartic, compoſed of bitter ingredients, or Epſom ſalt, may be given.

When the ſtomach and inteſtines are purged, bitter elixirs and tinctures ſhould be uſed, combined with aromatics, from fifty to ſixty drops, or upwards, to reſtore the tone of the ſtomach. Candied ginger, orange-peel, or elixir vitrioli, eſpecially when the peccant humour is alkalious or bilious, may be properly added to the infuſions of bitter-roots and herbs, with aromatics in wine, eſpecially wormwood wine, and the like ſtomachic liquors.

When the crudities of the ſtomach are acid, abſorbents are proper, ſuch as crabs eyes, mother of pearl and coral, and then a ſuitable purge of aloetic pills or rhubarb, or a bitter cathartic ſalt. Magneſia alba is likewiſe uſeful on this account, being abſorbent and uſeful in the hypochondriac paſſion. This ſhould be taken for ſome days, from fifteen to twenty grains; if the doſe be enlarged to a dram or two, it will purge pretty briſkly. The crudities being evacuated, bitters and aromatics are proper, as well as chalybeates and tinctures of ſteel; ſpa waters, and other mineral waters of the ſame kind, together with exerciſe, and now then a draught of generous wine will be found very advantageous. Smoaking tobacco frequently is hurtful, as well as drinking of drams; the diet ſhould be regular, and the patient muſt avoid aliments that are hard of digeſtion, fat, or flatulent, and alſo intenſe ſtudies.

ANSÆ, in aſtronomy, are two parts of Saturn's ring, which appear on each ſide that planet, when viewed through a teleſcope. Theſe anſæ, or handles, ſometimes appear open, and ſometimes not; the reaſon of which ſee under the article SATURN.

ANSER, the gooſe, in natural hiſtory; ſee the article GOOSE.

ANSER, in aſtronomy, a ſmall ſtar of the fifth magnitude in the milky-way, between the eagle and ſwan. For its right aſcenſion, declination, &c. ſee the conſtellation VULPECULA.

ANSES, in aſtronomy, the ſame with anſæ. See ANSÆ.

ANT, *Formica*, in natural hiſtory, the name of a well-known inſect, celebrated both for its induſtry and œconomy.

The ſight of ants is really very inſtructive. They are a little people united, like the bees, in a republic governed by its own laws and politics. They have a kind of oblong city, divided into various ſtreets, that terminate at different magazines. Some of the ants conſolidate the earth, and prevent its falling in, by a ſurface of glue with which they incruſt it. Thoſe which we commonly ſee, amaſs ſeveral ſplinters of wood, which they draw over the tops of their ſtreets, and uſe them as rafters to ſuſtain the roof; and acroſs theſe they lay another rank of ſplinters, and cover them with a heap of dry ruſhes, graſs, and ſtraw, which they raiſe with a double ſlope, to turn the current of the water from their magazines; ſome of which are appropriated to receive their proviſions, and in the

the others they depoſit their eggs, and the worms that proceed from them.

As to their proviſions, they take up with every thing eatable, and are indefatigable in bringing home their ſupplies. You may ſee one loaded with the kernel of ſome fruit, another bends under the weight of a dead gnat. Sometimes ſeveral of them are at work on the carcaſe of a May-fly, or ſome other inſect. What cannot be removed they eat on the ſpot, and carry home all that is capable of being preſerved. The whole ſociety is not permitted to make excurſions at random: ſome are detached as ſcouts, to get intelligence; and, according to the tidings they bring, all the community are upon the march, either to attack a ripe pear, a cake of ſugar, or a jar of ſweet meats; and, in order to come to this jar, they leave the garden, and aſcend the houſe; there they find this mine of ſugar, this rich Peru of ſweets, that opens all its treaſures to their view. But their march to it, as well as their return from it, is under ſome regulation: the whole band is ordered to aſſemble and move in the ſame track; but the injunction is not executed with much ſeverity, and they have liberty to expatiate when they have an opportunity to ſpring any game in the country. The green vermin that make an infinite waſte among flowers, and cockle the leaves of the peach and pear trees, are ſurrounded with a glue, or kind of honey, which is ſought for by the ants with great avidity; but they are not ſollicitous either for the fleſh of theſe creatures, or for any part of the plant. Theſe are the vermin who are the authors of all that deſtruction to our trees, which is falſely imputed to the ants, and draws upon them a very unjuſt and cruel perſecution.

The ants, after they have paſſed the ſummer in a conſtant employment and fatigue, ſhut themſelves up in the winter, and enjoy the fruits of their labour in peace; however, it is probable, they eat but little in that ſeaſon, and are either benumbed, or buried in ſleep, like a multitude of other inſects; and therefore their induſtry in ſtoring up proviſions is not ſo much intended to guard againſt the winter, as to provide, during the harveſt, a neceſſary ſuſtenance for their young. They nouriſh them, as ſoon as they leave the egg, with an aſſiduity that employs the whole nation; and the care of their little progeny is eſteemed a matter of importance to all the ſtate.

When the young quit the egg, they are little worms, no longer than common grains of ſand, and after they have for ſome time received their aliment, which is brought to them in common, and diſtributed in equal proportions, they ſpin a thread, and wrap themſelves up in a white web, and ſometimes in one that is yellow; at which period they ceaſe to eat, and become aurelias. In this ſtate, ſome people fancy they are the eggs of ants, when in reality they are the nymphs, out of whoſe ruins the new piſmires are to riſe. Though the young diſcontinue their eating, their nurture ſtill proves very fatiguing to their parents. Theſe have generally ſeveral apartments, and remove their young from the nurſery to ſome other manſion they intend to people. They either raiſe the aurelias toward the ſurface of the earth, or ſink them to a diſtance from it, in proportion as the ſeaſon is either warm or cold, rainy or dry. They raiſe them when the weather proves ſerene, or when a long drought is ſucceeded by gentle dews; but, at the approach of night and cold, or the appearance of ſhowers, they claſp their beloved charge in their arms, and deſcend with them to ſuch a depth, that one muſt then dig above a foot into the earth before thoſe aurelias can be diſcovered.

If a mouſe, frog, or other like animal, be placed in an ant-hill, he will be devoured, in a few days, to the bones and ligaments. Hence we are furniſhed with a method of obtaining ſkeletons of thoſe animals, exquiſitely beautiful and perfect, far ſurpaſſing any thing that can be executed by artificial anatomy. The ſubject is for this purpoſe to be incloſed in a wooden box, and properly diſtended, to prevent the parts from collapſing or being cruſhed together by the earth. The box is to be perforated with a number of holes, through which the inſects will preſently find their way.

ANT-EATER, in natural hiſtory, the name of an American quadruped that lives upon ants.

This creature is as long and as tall as a middle-ſized dog; his hind legs reſemble thoſe of the bear; but his fore legs are more ſlender. His fore feet are flat, and divided into four toes, armed with long claws; but thoſe behind have five toes. His head is long, with a ſharp prominent ſnout, ſmall round black eyes, and very black ears. Thoſe that have meaſured the tongue, affirm, that they have found it upwards of two feet in length, but very ſlender: he is obliged to bend part of it back when he keeps it within his mouth, the jaws being too ſhort to contain it without this artifice.

He lives upon ants, as was obſerved above, and when he has found out one of their neſts, he opens the upper part of it with his claws, that he may have room to put in his ſnout and tongue. This is beſmeared with a ſlimy liquor, and is ſoon covered with ants, when he draws it into his mouth and ſwallows them. He repeats this practice as long as they will run into the ſame ſnare.

The tail of this creature is very remarkable, and in ſome meaſure reſembles that of the fox. It is generally two feet in length, almoſt flat, and covered on all ſides with hair, from fifteen to twenty inches long: it is a little harſh, which gives it ſomewhat the appearance of a horſe's tail; is very ſtrong, and he can move it juſt as he pleaſes; when he turns it upon his back, it entirely covers it,

it, and defends the creature from the rain, which he greatly diſlikes.

ANT-BEAR, the ſame with ant-eater deſcribed in the preceeding article.

ANT-HILLS, in huſbandry, are little hillocks of earth which the ants throw up for their habitation for the breeding their young. They are a very great miſchief to dry paſtures, not only by waſting ſo much land as they cover, but by hindering the ſcythe in mowing the graſs, and yielding a poor hungry food pernicious to cattle.

The manner of deſtroying them is to cut them into four parts from the top, and then dig into them ſo deep as to take out the core below, ſo that, when the turf is laid down again, it may lie ſomewhat lower than the level of the reſt of the land; and this will prevent ants from returning to the ſame place, which otherwiſe they would certainly do. The earth that is taken out muſt be ſcattered to as great a diſtance as may be, otherwiſe they will collect it together and make another hill juſt by.

The proper time for doing this is winter, and, if the places be left open, the froſt and rains of that time of the year will deſtroy the reſt; but in this caſe care muſt be taken that the holes are covered up early enough in the ſpring, otherwiſe they will be leſs fertile in graſs than the other places.

In Hertfordſhire they uſe a particular kind of ſpade for this purpoſe. It is very ſharp, and formed at the top into the ſhape of a creſcent; ſo that the whole edge makes up more than three fourths of a circle: this cuts in every part, and does the buſineſs very quickly and effectually: others uſe the ſame inſtruments that they do for mole-hills.

Human dung is a better remedy than all theſe, as is proved by experiment; for it will kill great numbers of them, and drive all the reſt away, if only a ſmall quantity of it be put into their hills.

ANTA, in ancient architecture, a ſquare pilaſter, placed at the corners of the buildings. Le Clerc uſes the term to ſignify a kind of ſhaft of a pillar, without baſe or capital, and even without any moulding.

ANTAGONIST *Muſcles*, in anatomy, are thoſe which have oppoſite functions, as flexors and extenſors; abductors and adductors, &c.

ANTARCTIC, or ANTARTIC, in a general ſenſe, denotes ſomething contrary or oppoſite to the northern or arctic pole; thus the antarctic pole is the ſouthern end of the earth's axis; and the antarctic circle is one of the leſſer circles of the ſphere, parallel to the equator, and diſtant 23° 30′ from the ſouth pole: it is likewiſe one of thoſe circles which in geography and aſtronomy are called the polar circles.

ANTARES, in aſtronomy, a bright ſtar of the firſt magnitude in ſcorpio. This ſtar is proper to be obſerved with the moon, when ſhe has ſouthern declination, for determining the longitude, as well as ſettling the moon's place, &c. See the conſtellation SCORPIO.

ANTE, in heraldry, implies the pieces being let into one another, in the form expreſſed in blazoning; as by dove-tails, rounds, ſwallow-tails, or the like.

ANTECEDENT, in a general ſenſe, implies ſomething that goes before another, either with regard to time or place.

The word is Latin, *antecedens*, and compounded of *ante*, before, and *cedo*, to go.

ANTECEDENT, in grammar, is the word to which the relative refers. Thus in the ſentence, "The book that we read," the word book is the antecedent.

ANTECEDENT, in logic, is the firſt propoſition of an enthymema. See the article ENTHYMEMA.

ANTECEDENT, in mathematics, is the firſt term in any ratio, or proportion, when the terms are compared together. Thus, in the ratio of 7 to 8, or of x to y, 7 and x, are the antecedents, and 8 and y, the conſequents.

ANTECEDENT *Decree*, in the ſchool philoſophy, is a decree preceding ſome other decree. It is a famous diſpute whether predeſtination be a decree antecedent, or ſubſequent to faith.

ANTECEDENT *Signs*, among phyſicians, ſuch as are obſerved before a diſtemper is formed ſufficiently to be reduced to any particular claſs. Thus a bad diſpoſition of the blood is an antecedent ſign, becauſe it precedes an infinite number of diſeaſes.

ANTECEDENTIA, in aſtronomy, an apparent motion of a comet, planet, or other point in the heaven toward the weſt, or contrary to the order of the ſigns.

ANTECHAMBER, in architecture, implies the chamber that leads to the chief apartment.

The word is compounded of the Latin prepoſition, *ante*, before, and *chamber*.

ANTEDATE, in law, implies a ſpurious or falſe date, prior to the true date of any writing.

The word is compounded of the Latin, *ante*, before, and *datum*, a date.

ANTEDILUVIAN, ſignifies in its general ſenſe, ſomething that exiſted before the deluge. It is a Latin word, compounded of *ante*, before, and *diluvium*, a deluge.

ANTEDILUVIAN *Philoſophy*, means that philoſophy which was known and practiſed by the patriarchs before the flood. This in all probability was very confined and imperfect; as it is obſervable that in all countries, where the arts and ſciences have flouriſhed, they have advanced by a regular progreſſion to maturity. Indeed it is in theſe, as in the body natural; which by a daily, yet imperceptible encreaſe, goes on from infancy to youth,

youth, and from youth to manhood; 'till at length it arrives at its full ſtrength and vigour.

ANTEDILUVIAN *World*, the earth with its inhabitants, as they exiſted before the deluge. Dr. Burnet in his *Philoſophical Romance*, which he calls a Theory of the Earth, ſuppoſes, that before the flood there was no ſea, no mountains, no rocks, or broken caves, but all was one continued and regular maſs, ſmooth, ſimple, and compleat. He carries us back, to prove this hypotheſis, to the original chaos; in which were mingled together air, water, and earth, without any order of higher or lower, heavier or lighter, ſolid or volatile. When the earth firſt aroſe out of this chaos, he ſays the heavier and groſſer parts ſunk down to the middle, (for there he ſuppoſes the centre of gravity) and the lighter ſwam above: this lighter fluid part was impregnated with oily and bituminous ſubſtances, as well as the finer and more ſubtile parts of the earth, which concreted, and formed a cruſt upon the water. This cruſt was the antediluvian earth; in praiſe of which the very ingenious doctor expatiates largely, as the fitteſt ſoil that could poſſibly have been invented, to produce every thing neceſſary for the ſupport of its inhabitants. "In this ſmooth earth, ſays he, "were the firſt ſcenes of the world, and the firſt "generations of mankind; it had the beauty of "youth and blooming nature, freſh and fruitful, "and not a wrinkle, ſcar, or fracture, in all its "body; no rocks nor mountains, no hollow "caves nor gaping channels, but even and uni"form all over. And the ſmoothneſs of the earth "made the heavens ſo too; the air was calm and "ſerene; none of thoſe tumultuary motions and "conflicts of vapours, which the mountains and "winds cauſe in ours: it was ſuited to a golden "age, and to the firſt innocency of nature."

What a deplorable thing was the tranſgreſſion of Adam, and the licentiouſneſs of his deſcendants, that they ſhould deprive us of ſo charming a world, as is here deſcribed? and how little providence muſt there have been in the wiſe Author of nature, to create ſo beautiful a frame as this, which in ſo ſhort a ſpace as about ſixteen hundred years, was to be changed into its preſent form? a form that is all over rugged and uneven; with croſs and uncouth deſarts, rough and craggy mountains, wild and tempeſtuous oceans, hollow grots, and dreary caverns, with a thouſand other diſmal appearances, the very idea of which would have frightened poor Adam out of his ſenſes. What ſhall we ſay now, if notwithſtanding what Dr. Burnet has told us, the world was faſhioned by the divine Architect, pretty nearly as we ſee it at preſent? Dr. Woodward is clearly of this opinion, that the face of the terraqueous globe, before the deluge, was the ſame as it is now, viz. unequal, diſtinguiſhed into rocks and plains, dales and mountains; that there were ſprings and rivers; that the ſea was then ſalt, as it is at preſent, and ſubject to winds and tides; that there was the ſame ſucceſſion of weather, and the ſame viciſſitudes of ſeaſons.

Mr. Whiſton imagines that the chaos, out of which this earth of ours was formed, had been the atmoſphere of a comet; that the annual motion of the earth began as ſoon as it aſſumed a new form, but that the diurnal motion did not take place till after the fall of Adam; that before the deluge the year began at the autumnal equinox, which is not improbable, as the Jews began their year at that period, before they returned from their captivity in Egypt; that the orbit of the earth was a perfect circle, and that the ſolar and lunar years were the ſame, each conſiſting of juſt three hundred and ſixty days.

ANTELOPE, in natural hiſtory, the name of an animal called, by Latin authors, *gazella Africana*, and thought by ſome to be the ſame as the Lybian goat.

The antelope is very ſwift; has a white belly, and the reſt of the body of a fallow colour; the white and the fallow on the ſides are parted by a black ſtripe; the eyes are black, the ears large, the tail blackiſh, and a ſtripe a little more brown than the reſt of the hair deſcends from the eye down to the muzzle. He is about the ſize of a roe-buck, and his hair very ſhort. The eyes are black and large; and the horns are likewiſe black ſtriped, croſsways. They are about fifteen inches long, and near an inch in diameter at the bottom.

ANTENNÆ, in natural hiſtory, ſlender bodies, with which nature hath furniſhed the heads of inſects, being the ſame with what are called in Engliſh the horns or feelers.

ANTEPENULTIMA, in grammar, the third ſyllable from the end of any word, or the laſt ſyllable but two.

ANTEPREDICAMENTS, in logic, certain preliminary queſtions tending to illuſtrate the doctrine of predicaments and categories. See PREDICAMENTS.

ANTEVIRGILIAN *Huſbandry*. See HUSBANDRY.

ANTHELIX, in anatomy, the inward protuberance of the external ear. See EAR.

ANTHELMINTICS, among phyſicians, medicines proper to deſtroy worms. See WORMS.

ANTHEM, a church ſong, conſiſting of ſome paſſages of Scripture ſet to muſic, and adapted to ſome ſolemnity.

ANTHEMIS, in botany, a name given by Linnæus for the chamæmelum of Tournefort. See CHAMOMILE.

ANTHERÆ, among botaniſts, are the ſmall buttons or ſummits, which grow on the tops of the filaments or ſtamina of flowers, and contain a

prolific powder, analogous to the male ſperm of animals.

ANTHERICUM, in botany, a name given by Linnæus to the phlangium and aſphodel of other botaniſts. See the article SPIDERWORT.

ANTHOLOGY, a diſcourſe or treatiſe on flowers.

The word is compounded of the Greek, ανθος, a flower, and λογος, a diſcourſe.

ANTHOLOGY is alſo a name given to a collection of Greek epigrams.

ANTHONY, or *Knights of St.* ANTHONY, a military order inſtituted by Albert, duke of Bavaria, Holland, and Zealand, when he meditated a war againſt the Turks in 1382. The knights wore a collar of gold, made in the form of a hermit's girdle, from which hung a ſtick, cut in the form of a crutch; as repreſented in the pictures of St. Anthony.

St. ANTHONY'*s Fire*, a name ſometimes given to the eryſipelas. See ERYSIPELAS.

ANTHOCEROS, in botany, a genus of moſſes which are deſtitute of flower, petals, and ſtamina inſtead of which there is a ſingle, very long, and ſubulated anthera, ariſing from the baſe of the calyx: the female flower, which is monophyllous, and divided into ſix parts, is often found on the ſame plant with the male, and ſometimes on a different plant; it commonly contains three roundiſh ſeeds, which are naked, and lodged in the bottom of the calyx.

ANTHOLYZA, in botany, a genus of plants in the Linnæan ſyſtem, producing liliaceous flowers; the roots are bulbous and round, from which ariſe ſeveral deeply furrowed leaves about a foot long; between theſe ariſe the flower ſtem, which hath ſeveral flowers, conſiſting of one leaf divided into ſix unequal parts at top; one of theſe ſegments is ſtretched far beyond the other, and is erect; the margins are waved and cloſed together, enveloping three filaments crowned with pointed antheræ: beneath the flower is placed the germen, ſupporting a ſingle ſtyle, which is topped with a trifid reflexed ſtigma; the germen afterward turns to a three-cornered capſule of three valves, containing ſeveral triangular ſeeds. This genus is comprehended among the gladiolus by other botaniſts.

ANTHORA, in botany, an appellation given to ſeveral ſpecies of the aconite, called by ſome helmet-flower, and antithora, ſuppoſed to be the zedoary of the Arabians. The anthora radix of the ſhops is the root of the aconitum ſalutiferum of C Bauhine, and is what the officinal preſcriptions intend, whenever this is ordered. It grows in the mountains of Switzerland and Savoy, and is of a warm bitteriſh taſte, and reckoned a cardiac and alexipharmic: it is eſteemed good in malignant fevers; and is preſcribed as an antidote againſt poiſons, particularly to obviate the bad effects of the poiſonous aconite. It is much of the ſame nature as the contrayerva root, on which account it is called by ſome the German contrayerva.

ANTHOS, in botany, a name given by ſome writers to the roſemary. See the article ROSEMARY.

ANTHRAX, a name by which the ancients called a gem known at preſent by the name of carbuncle. See CARBUNCLE.

ANTHROPOGRAPHY, the deſcription of the human body, its parts, ſtructure, &c.

The word is formed from the Greek, ανθρωπος, a man, and γραφω, to deſcribe.

ANTHROPOMORPHITES, was the name given to a ſect of heretics, who through ignorance and ſimplicity took every thing that was ſpoken of God in Scripture in a literal ſenſe, as that Adam heard the voice of God *walking* in the garden; from which they concluded that the Almighty had the ſhape of a man, with real hands and feet, and the ſame organization of members that we have. And when it is ſaid, *That God created man in his own image*, they ſuppoſed this to mean as to his outward form, as well as his ſoul; which was thought by them to be corporeal, and to have a real and viſible ſhape and figure.

The word is derived from the Greek, ανθρωπος, a man, and μορφη, the form or figure. They were alſo called Audiens.

ANTHROPOPHAGY, the act of eating human fleſh.

The word is formed from the Greek, ανθρωπος, a man, and φαγω, to eat.

ANTHOSPERMUM, in botany, the amber-tree, ſo called from the leaves when bruiſed emitting a fragrant ſcent: it is a polygamious plant, producing male, female, and hermaphrodite flowers; the male flowers are apetalous, but its calyx ſupports four upright capillary filaments; the female flowers are the ſame as the male, but inſtead of ſtamina there is an oviary ſupporting two recurved ſtyles, which becomes a roundiſh capſule, containing ſeveral angular ſeeds; the androgynous flower partakes of the male and female, having two piſtils and four filaments, with the germen below. This plant has been called by ſome, *frutex Africanus ambram ſpirans*, or, The African ſhrub ſmelling like amber.

ANTHYPOPHORA, in rhetoric, the ſame with hypophora. See HYPOPHORA.

ANTICARDIUM, in botany; ſee the article SCROBICULUM.

ANTICHRIST, in ſcripture, implies one who will oppoſe the religion of Jeſus Chriſt, and will appear upon the earth as the great enemy of Chriſtianity, ſome time before the end of the world. This is he whom St. Paul, in his ſecond epiſtle to the Theſſalonians, ſpeaks of as "the man of ſin,

" ſin, the ſon of perdition, who oppoſeth and " exalteth himſelf above all that is called God, or " that is worſhipped; ſo that he, as God, ſitteth " in the temple of God, ſhewing himſelf that he " is God." The coming of Antichriſt will be preceded by many ſigns in heaven, and upon the earth: " The ſun ſhall be darkened, and the " moon ſhall not give her light, and the ſtars " ſhall fall from heaven, and the powers of hea- " ven ſhall be ſhaken." His reign however will be ſhort, and for this reaſon, becauſe otherwiſe " no fleſh would be ſaved," ſince he will " de- " ceive if it is poſſible even the elect." Some are of opinion that it will laſt three years and a half, according to theſe words of Daniel, " and it ſhall " be for a time, times, and an half." This they pretend is confirmed by ſeveral other paſſages of Scripture, particularly in the Revelations, where it is ſaid, " the holy city ſhall be trodden under foot " forty and two months." Enoch and Elias will be ſent by God to aſſiſt and encourage the faithful for twelve hundred and ſixty days, and to fight with Antichriſt, who ſhall overcome and ſlay them; but after three days and a half the Spirit of Life from God ſhall enter into them, and they ſhall be revived.

Some furious Proteſtants have endeavoured to prove, with far more zeal than charity, that this prophecy has been already fulfilled, and that Antichriſt is neither more nor leſs than the Pope of Rome.

ANTICOR, in farriery, implies an inflammation of a horſe's throat, being the ſame with the quinzy in the human ſpecies.

ANTIDOTE, among phyſicians, implies a remedy againſt peſtilential diſeaſes.

It alſo ſignifies a medicine which prevents the ill effects of poiſon.

ANTIENT, or ANCIENT, a term applied to things that exiſted long ago.

ANTIENT, in a military ſenſe, implies the enſign or colours.

ANTIENT, in naval affairs, ſignifies the flag carried at the ſtem of a ſhip.

ANTILOGARITHM, is the logarithm of the co-ſine, co-tangent, or ſecant. See the article LOGARITHM.

ANTILOGY, in literature, denotes an inconſiſtency between two or more paſſages of the ſame book.

ANTIMONARCHICAL, a name given to whatever oppoſes monarchical government.

ANTIMONY, in natural hiſtory, a blackiſh mineral ſubſtance, ſtaining the hands, full of long, ſhining, needle-like ſtriæ, hard, brittle, and conſiderably heavy.

It is found in different parts of Europe, as Bohemia, Saxony, Tranſylvania, Hungary, and France, commonly in mines by itſelf, intermixed with earthy or ſtony matters. Sometimes it is blended with the richer ores of ſilver, and renders the extraction of that metal difficult; antimony volatilizing a part of the ſilver, or, in the language of the miners, robbing the ore. Antimony is ſeparated from its natural impurities by fuſion in an earthen pot, whoſe bottom is perforated with a number of holes; the fluid antimony paſſing through, whilſt the unfuſible matters remain behind. The melting veſſel is let into another pot ſunk in the ground, and which ſerves as a receiver: this laſt is of a conical figure, and ſuch accordingly is the ſhape of the loaves of antimony met with in the ſhops. The juncture of the two veſſels is cloſely luted; the uppermoſt one covered, and a fire made round it; and ſeveral ſets of this apparatus worked at once. In ſome places, inſtead of a pot with a perforated bottom, one is taken which has no bottom, and a perforated iron-plate placed betwixt it and the receiver; but the other method is to be preferred, as antimony in fuſion is apt to diſſolve a part of the iron.

Antimony is not a pure but a ſulphurated ſemimetal. Thrown into the fire, it burns with a blue flame and ſulphureous vapours: on digeſting powdered antimony in aqua regia, the metallic part is diſſolved, and the ſulphur left. The ſulphur of antimony, purified from the metallic part, is perfectly the ſame with the common brimſtone of the ſhops, poſſeſſing the ſame properties, and anſwering the ſame uſes: if the ſemimetal, freed from the ſulphur naturally mixed with it, be afterwards melted with common brimſtone, it reſumes the appearance and qualities of crude antimony. Many have imagined, that this mineral, beſides common ſulphur, contains a golden or ſolar ſulphur; becauſe antimony purifies and heightens the colour of gold, and becauſe it diſſolves, as gold does, in aqua regia. But, with regard to the ſolubility in aqua regia, it is not the ſulphureous, but the metallic matter of the antimony that diſſolves: if nothing beſides gold and antimony were acted upon by that menſtruum, there might be ſome plauſibility in the argument; but ſurely, when ſo many ſubſtances diſſolve in it, as iron, copper, lead, tin, quickſilver, zinc, various earths, &c. ſolubility in aqua regia can be no proof of a ſolar impregnation. In the purification of gold, the ſulphur of antimony has no other effect than common brimſtone would equally produce: when gold, containing an admixture of other metals, is melted with antimony, the ſulphur, having little affinity with its own ſemimetal, forſakes it, and unites with the ſilver, copper, or other metallic bodies mixed with the gold, but has no action on the gold itſelf: thus only the impurities of the gold are combined with the ſulphur of the antimony into a ſcoria, which flows on the ſurface; whilſt the gold and the ſemimetal of the antimony form one compound

compound at the bottom: if this compound be expoſed to a ſtrong fire, and a free draught or blaſt of air, it evaporates in fumes, and leaves the gold pure behind it. This proceſs ſhews the reſiſtance of gold to ſulphur, and to the volatilizing power of the antimonial ſemimetal, but ſurely gives no foundation for imagining a ſolar ſulphur to exiſt in antimony. As gold is the only metal (platina excepted) that totally reſiſts antimony or its ſulphur, this mineral has been called by the chemiſts *balneum ſolius ſolis*, *balneum regis*, *lupus*, *ultimus judex*, &c.

Hoffman has given an account of the different medicinal effects of antimony, as depending on its different treatments. He obſerves, that crude antimony, on account of the regulus being corrected by the ſulphur, is not only ſafe, but in many caſes a medicine of great ſervice, both for man and other animals. That by ſimple fuſion it acquires a degree of malignity; but a far greater if melted with half its weight of nitre, which conſumes nearly all the ſulphur, and leaves the regulus bare. That antimony, or its regulus, mixed with common ſalt, calcined over a gentle fire for ſeveral hours, and kept continually ſtirring, and afterwards edulcorated with water, yields an aſh-grey calx, which is ſo fixed as to bear a melting heat, and proves a mild and ſafe diaphoretic, void of any malignant or emetic quality. That antimony, by calcination with a gentle fire in an earthen veſſel, in the open air, changes into a calx, which melts with difficulty, and which has no malignity. That if this calx be melted with a ſtrong fire into glaſs, it becomes ſo active, that a few grains ſhall occaſion violent vomiting and purging, or even mortal convulſions and inflammations. That the powdered regulus, calcined in a glaſs-vial placed in ſand for ſeveral days, becomes a greyiſh diaphoretic powder; which reduced into regulus by fuſion with powdered charcoal, nitre, and a little fat, proves again virulent. That when antimony is melted with one fourth its weight of ſalt of tartar, the whole poured into a mould, the ſcoria ſeparated, and the more ponderous matter pulverized; the reddiſh powder thus obtained, is ſalutary: but that when antimony is melted with three or four times its weight of ſalt of tartar, both the ſcoriæ and the regulus are virulent. That equal parts of antimony and nitre, melted together, yield a virulent maſs; but one part of antimony, with two or three of nitre, is an uſeful diaphoretic. That on melting the diaphoretic calces with fat, charcoal, powder and nitre, the virulent regulus is revived. And thus one preparation may be changed into another, a ſalutary into a poiſonous, and a poiſonous into a ſalutary one.

Preparations of ANTIMONY. The preparations of antimony are extremely numerous. Lemery, in his Treatiſe on Antimony, deſcribes no leſs than two hundred; among which there are many good, and many uſeleſs ones. That gentleman was an excellent chemiſt, but an unhappy philoſopher: we may depend on his operations, but we ſhould diſtruſt his theory. With regard to the antimonials, the greater number even of the common preparations is unneceſſary; many of them differing little from one another, and all of them being either emetic or diaphoretic. The preparations of antimony may be ranged, according to the general operations by which they are produced, under four heads; thoſe obtained by ſolution, by diſtillation, by ſublimation, and by calcination.

Gloden Sulphur of ANTIMONY. If powdered antimony be boiled in alkaline lixivia, or ſope leys; the ſulphur, and, by the mediation of the ſulphur, a part of the regulus, will be diſſolved into a yellowiſh red liquor. Any acid added to this ſolution precipitates what the alkaline liquor had taken up, in form of a yellowiſh or reddiſh powder, called ſulphur, or golden ſulphur of antimony; the powder which ſettles firſt is groſſer and darker-coloured than thoſe which follow; it appears of a deep reddiſh brown, whilſt that which ſubſides laſt is of a pale yellow. The firſt is alſo the moſt active.

There are ſundry variations of this proceſs, both in regard to the ſolution and the precipitation. A difference in the manner of preparing the ſolution does not ſeem to affect the virtue of the medicine; but a difference in the acid uſed for the precipitation does; different acids having very different effects upon antimony: thus, whilſt the marine renders it highly corroſive, or emetic, the addition of the nitrous deſtroys the virulence of both preparations, and renders the antimony mildly diaphoretic.

All the antimonial ſulphurs are emetic and cathartic: thoſe which precipitate firſt are much more ſtrongly ſo than the powder which falls laſt; the laſt precipitates, if they prove emetic once or twice, ceaſe to have that effect upon continuing their uſe, and act chiefly as diaphoretics; and hence are greatly to be preferred to the firſt. A powder is vended by the Carthuſian friars in Paris, at a conſiderable price, as a ſpecific againſt ſundry diſorders; commonly called poudre des chartreux, but by themſelves kermes mineral. See KERMES *Mineral*.

Butter of ANTIMONY. For diſſolving the regulus of antimony without the ſulphur, the moſt concentrated ſpirit of ſalt, or aqua regis, is neceſſary. For obtaining the ſolution in ſpirit of ſalt, mercury ſublimate and powdered antimony are mixed together, and digeſted in a glaſs-retort placed in ſand: the marine acid in the ſublimate forſakes the mercury, and corrodes or diſſolves the antimonial regulus; whilſt the mercury of the ſublimate unites with the antimonial ſulphur. But the ſolution of the regulus, thus effected, cannot

cannot be commodiouſly ſeparated from the other matter but by diſtillation: on increaſing the fire, the regulus ariſes, diſſolved in the concentrated acid not in a liquid form, but in that of a thick unctuous ſubſtance, like butter; hence called butter of antimony. The butter liquefies by heat; and requires the cautious application of a live coal to melt it down from the neck of the retort. By rectification or expoſure to the air, it becomes fluid, but ſtill retains the name of butter. The addition of water, either in its thick or fluid ſtate, by diluting the acid, precipitates the regulus diſſolved in it. The proportions of ſublimate and antimony commonly employed, are three parts of the former to one of the latter.

Flowers of ANTIMONY. Theſe are prepared by ſubliming either the crude antimony, or the regulus, with a number of aludels; the fire being kept up ſtrong, and a blaſt of air impelled occaſionally by a pair of bellows upon the matter in the ſubliming pot, to promote its evaporation. The antimonial flowers are in general of great activity, and though recommended by ſome as arcana in particular diſorders, require to be uſed with great caution.

Cinnabar of ANTIMONY. After the diſtillation of butter of antimony, the mercury and the ſulphur, contained in the ingredients made uſe of for that proceſs, remain behind in the retort. This compound appears of a black colour; urged with a ſtronger fire than that which elevated the butter, it ſublimes into a red maſs, called cinnabar of antimony. This cinnabar has been by many preferred to the common factitious cinnabar, but on no juſt foundation: they both conſiſt of mercury combined with ſulphur; and the only difference betwixt them is, that the antimonial cinnabar contains ſomewhat more ſulphur than the other, and hence appears of a darker colour.

Glaſs of ANTIMONY. This is chiefly prepared by ſome particular perſons at Amſterdam and Rouen, who have furnaces contrived on purpoſe for calcining large quantities of antimony with little expence of fuel. The glaſs may be eaſily made, by urging the calx in a crucible with a ſtrong fire, and throwing in, towards the end, a little crude antimony or ſulphur. When the vitrification is completed, the glaſs is poured on a copper plate, or on a flat ſtone. The glaſs of antimony is uſed only for making other emetic preparations, as the emetic wine, &c.

Hepar ANTIMONII, liver of antimony. Equal parts of crude antimony and nitre mixed together, ſet on fire and ſuffered to deflagrate in an iron mortar, which may be covered with a perforated plate, or injected by degrees into an ignited crucible, yield a liver-coloured maſs, called hepar antimonii, which pulverized and edulcorated with water is named crocus metallorum. Two, three, or even one grain of either of theſe preparations occaſion violent anxieties and vomitings; though a dog will bear a dram, and a horſe a whole ounce, without being apparently any otherwiſe affected than in having the alvine diſcharge increaſed. The emetic wine, emetic tartar, and other medicines made from the glaſs, may alſo be made from the crocus.

Diaphoretic ANTIMONY. One part of antimony and two and a half or three of nitre, mixed together and deflagrated, yield a calx void of all emetic power, called diaphoretic antimony.

The martial Diaphoretic ANTIMONY, or *Specific Stomachic of Poterius*, is prepared by melting equal parts of antimony and iron filings, injecting upon them in fuſion thrice their weight of powdered nitre, and after the detonation is over, edulcorating and drying the calx. The jovial diaphoretic antimony, or antihectic of Poterius, is made in the ſame manner, from a mixture of tin and martial regulus of antimony, in the proportion of one part of tin to four of the regulus. This preparation has no claim to antihectic virtues, nor indeed to any ſalutary operation.

Regulus of ANTIMONY. The ſimple regulus of antimony is commonly prepared from equal parts of antimony, nitre, and tartar, mixed together and injected into a red-hot crucible: when the whole is thrown in, the crucible is to be covered, a ſtrong fire kept up for a quarter of an hour, and the matter poured out into a conical mould previouſly warmed and rubbed with greaſe. The yield of regulus will be larger, if the quantity of nitre is diminiſhed; or if the nitre and tartar are deflagrated together, in the proportion of one part of the former to two of the latter, before their mixture with the antimony. The ſalts are reduced by the deflagration into a black alkaline coal; this is the ſubſtance commonly uſed by the chemiſts for promoting the fuſion of metallic calces, and reviving them into their metallic form, and hence is diſtinguiſhed by the name of black flux. Some have been accuſtomed to ſave the expence of nitre, by taking pot-aſh or other alkaline ſalts: the regulus is in both caſes the ſame. When the matter is grown cold, the ſcoriæ ſound on the ſurface are knocked off, the regulus reduced into coarſe powder, melted in a freſh crucible, and about one fourth its weight of purified nitre injected upon it; this depuration may be twice or thrice repeated with ſmaller proportions of nitre, till the ſcoriæ become ſemitranſparent and of an amber colour.

Martial Regulus of ANTIMONY. This preparation is obtained very commodiouſly from four parts of powdered antimony, two parts of iron nails or wire, and one part of nitre. The iron, made red hot in a crucible, ſoon melts upon adding the antimony; after which the nitre is to be injected, the crucible covered, and the matter, when

brought into thin fuſion, poured expeditiouſly into a warm greaſed cone. The regulus freed from the ſcoriæ is to be melted afreſh, with about one fourth its weight of nitre; and this purification, if neceſſary, repeated. If the regulus retains any ſuperfluous iron, it will look greyiſh, ſpongy, prove hard to break, and difficult of fuſion: in ſuch caſe, the ſcorification of all the iron, by means of nitre, would be a tedious work; but the addition of a little crude antimony, or common ſulphur, will abſorb it at once; and the injection of nitre will now ſoon complete the purification, and render the regulus of a ſparkling white colour. The ſcoriæ are yellow and ſemitranſparent, like amber; if the quantity of nitre has not been too large, they prove an exceſſively ſtrong fiery alkali, diſtinguiſhed by the name of nitrum cauſticum. The yellow ſcoriæ, which ſeparate in the depuration of the ſimple regulus with nitre, are likewiſe alkaline, but want the cauſticity of theſe: the ſcoriæ produced from the martial regulus, by calcination with tartar, take fire on being expoſed to the air. If either regulus, after due purification, be haſtily poured into the mould whilſt in exceeding thin fuſion, and if the quantity of ſcoriæ covering the ſurface is conſiderable, the regulus, when grown cold, exhibits the appearance of a ſtar upon the top. For producing this appearance, there is no occaſion for any particular ſort of antimony, or any particular iron, or any particular conſtellation, or ſeaſon, or weather, as many have idly imagined; the whole depending upon the circumſtance abovementioned.

The ſimple regulus is caſt into cups, which, like thoſe made from the glaſs, communicate an emetic quality to wines; and into pills, like ſhot, which prove ſtrongly purgative, and do not loſe their virtue in paſſing through the body; whence their name pilulæ perpetuæ.

Tincture of ANTIMONY. There are various tinctures of antimony, which ſome have fondly imagined to participate of ſolar, venereal, antimonial, and other impregnations. They appear to be all no other than ſimple alkaline tinctures; their colour proceeding from the oily matter of the ſpirit of wine, heightened by the cauſtic alkali. Spirit of wine conſiſts of an oil highly attenuated and combined with water into one ſeemingly homogene liquor: if the moſt highly rectified ſpirit, which exhibits no mark of any phlegm, be employed for making theſe tinctures, it will now yield in diſtillation a good quantity of water; the oil, before combined with that water, having been abſorbed by the alkali. If cauſtic alkaline ſalt, alone, be poured hot into rectified ſpirit, and the mixture digeſted for ſome time, a tincture will be obtained, not diſtinguiſhable from the antimonial. If ſulphur be added in either caſe, the tincture will receive a conſiderable taſte and ſmell from that ingredient.

ANTINOMIANS, a ſect of heretics ſo called, becauſe they rejected the law as of no uſe under the Goſpel diſpenſation. The word is derived from the Greek *ανθ*, againſt, and *νομ*, the law.

They held that good works were not profitable, nor evil works pernicious to the ſoul; that God never puniſhed any nation for the ſins of its inhabitants; that murder, adultery, drunkenneſs, and ſuch like, were real and damnable crimes in others, but not in them, juſt as equivocation and lying was no ſin in faithful Abraham; that the children of God, being once aſſured of their ſalvation, can ſin no more, or as Mr. Weſley ſays, are in a ſinleſs ſtate; that no man's conſcience ſhould be offended becauſe it is ſtained with guilt; that a hypocrite may have all the graces which Adam had before his fall; that faith in Jeſus Chriſt is the only and all-ſufficient means of ſalvation; that God regards no one for his piety and virtue; with many other abſurd tenets too tedious to enumerate. One John Agricola is ſaid to have been the author of this ſect, in the year 1535.

ANTIPARALLELS, in geometry, are thoſe lines, as DE and BC (Plate X. *fig.* 5.) which form the ſame angles as ADE and BCA, with the two lines AB and CA cutting them, but in contrary ways or oppoſite directions, like parallel lines. Mr. Leibnitz in the Acta Erudit. an. 1691, p. 279. calls thoſe lines antiparallels, as GI, HK (plate X. *fig.* 6.) which cut two parallels AD and EF, ſo that the outward angle ABI, together with the inward one ACK, be equal to a right angle. When the ſides AB and AC of a triangle, as ABC (Plate X. *fig.* 5.) are cut by a line DE, antiparallel to the baſe BC, the ſaid ſides are cut reciprocally proportional by the ſaid line DE; that is, AD : BD : : EC : AE, the triangles ADE and ACB being ſimilar or equiangular.

ANTIPATHY, a natural averſion of one body to another; the oppoſite to ſympathy.

The word is Greek, *αντιπαθεια*, and compounded of *αντι*, againſt, and *παθ*, affection.

ANTIPERISTALTIC *Motion of the Inteſtines*, is a motion directly oppoſite to the periſtaltic. See the article PERISTALTIC.

ANTIPERISTASIS, in the peripatetic philoſophy, an imaginary method of increaſing the power or force of any quality, by the oppoſition of its contrary. Thus cold is ſaid to augment the heat of fire; a doctrine now ſufficiently exploded.

The word is Greek, *αντιπερισασις*, and compounded of *αντι*, about, and *περιστημι*, to encompaſs, or ſurround.

ANTIPHONY, alternate ſinging; as when a congregation, divided into two parts, repeats or ſings a pſalm or anthem, verſe for verſe, one after the other.

The word is compounded of the Greek, ἀντι, oppoſite, and φωνη, a voice.

Antiphony is oppoſed to ſymphony, which is ſinging jointly, or all together. St. Auſtin carries the original of this way of ſinging, in the weſtern church, no higher than the time of St. Ambroſe, when it was firſt introduced into the church of Milan; which example was ſoon followed by the other weſtern churches. What was the original of it in the eaſtern church, is not ſo certainly agreed upon by writers, either ancient or modern. It was a method of ſinging ſo taking and delightful, that it was often uſed, when only two or three were met together for private devotion. And Socrates particularly remarks of the emperor Theodoſius the Younger, and his ſiſters, that they ſung alternate hymns together every morning in the royal palace.

ANTIPHRASIS, in rhetoric, a figure, by which, in ſaying one thing, they mean the contrary. See the article IRONY.

The word is Greek, and compounded of ἀντι, oppoſite, and φραζω, to ſpeak.

ANTIPODES, in geography, a name given to ſuch as live diametrically oppoſite to each other on oppoſite meridians and parallels: at 180 degrees diſtant they have all things contrary; the one has ſummer and long days, or no nights, at the ſame time as the other has winter, ſhort days, or perpetual nights; it is likewiſe 12 o'clock at noon with one when it is midnight with the other.

When we conſider that the horizon of one is 90 degrees diſtant from the zenith of the other, it will be eaſy to conceive that when any cœleſtial object riſes to one in the eaſt, it ſets to the other in the eaſt; and when it ſets to one in the weſt, it riſes to the other in the weſt.

In former times it was conſidered as a fable for any one to ſay people walked with their feet oppoſite to ours; nor could they conceive that men or trees could ſubſiſt ſuſpended in air with their feet upwards; not conſidering that upwards and downwards ſignify nothing more than a leſs or greater diſtance from the center of the earth, to which all heavy bodies gravitate.

Plato is ſaid to have firſt hinted that there was any ſuch thing as antipodes, and is ſuppoſed to be the firſt inventor of the name. We need not wonder that this great philoſopher concluded the exiſtence of antipodes, when he before apprehended the earth to be ſpherical. However, their exiſtence were greatly diſputed by the ancients, eſpecially by St. Auguſtin, Lactantius, Boniface archbiſhop of Mentz, and many others, which held it even to be hereſy to believe there were any inhabitants on the oppoſite ſide of the globe.

In the Hiſtory of the Academy of Sciences 1741, the antipodes are conſidered in the following manner, with regard to their being diametrically oppoſite on the globe to each other:

If we ſuppoſe that a perpendicular or vertical line be drawn through any place whatever, and which conſequently paſſes through the zenith of that place, the oppoſite part on the ſurface of the globe, which this vertical line continued would cut, is the ſituation of the antipodes to that place: but this depends on a ſuppoſition of the earth's being a perfect ſphere; for if the earth be not a perfect ſphere, but an oblate or prolate ſpheroid, there are no reciprocal antipodes: that is, for inſtance, if a line be drawn through the zenith of London, and center of that city, which is in the northern hemiſphere, this line would cut the ſouthern hemiſphere in a point which will be diametrically oppoſite to London; but London then will not be the antipodes to this place. Thus the reciprocal equality of ſituation, latitude, day and night, in the oppoſite hemiſpheres at ſix months diſtance, and all that we are uſed to include in the idea of antipodes, as inſeparable from it, is no longer ſo; and muſt alter, in proportion as the figure of the earth deviates from a true ſphere. A little attention will convince us of this.

What we have advanced is founded on this poſition, that the ſphere, or, to render the theory more ſimple, the circle, is the only regular figure which all diametrical lines drawn through the center cut at right angles: therefore, in every figure terminated by another kind of curve, to inſtance in the ellipſis, the perpendicular drawn to one of its foci, or to its tangent, except the two axes which correſpond to the polar line, or a diameter drawn at the equator, will not paſs through the center, nor cut the oppoſite part of the ellipſis at right angles; therefore the nadir of Paris or London is not the zenith of their reſpective antipodes. So if, in the center of London or Paris, a perpendicular column were erected, and another in their reſpective antipodes, it would not make the ſame right-line, but would form an angle more or leſs acute, in proportion as the ellipſis departed more or leſs from a circle; and conſequently the latitude, days, nights, ſeaſons, &c. would alter in the ſame proportion. Places ſituated under either pole, or on the equator, are excepted for the reaſon we have before ſuggeſted; becauſe, in the former caſe, it is one of the axes of the ellipſis that joins both foci, and in the latter it is always a circle, the other axis of which is the diameter of the ellipſis; the ſpheroid, however oblate or prolate, being always ſuppoſed to reſult from the revolution of the elliptical meridian round the axis of the world.

ANTIPOPE, in the Romiſh church, implies a perſon elected pope in an irregular manner, in oppoſition to another.

ANTIPTOSIS, in rhetoric, is a figure which puts one caſe for another.

The

The word is Greek, and compounded of ἀντι, oppoſite, and πτωσις, a caſe.

ANTIQUARIAN *Society*.—A ſociety of antiquaries was formed in the city of London, about the year 1580, by ſome of the moſt learned men in the kingdom; but having been frequently interrupted and diſcontinued, very little can be ſaid concerning the ſame till the year 1717, when it was again revived by a number of gentlemen, ſtudious of antiquity in general, but more particularly deſirous to obtain all poſſible knowledge of the antiquities of their own country. With this view they agreed to meet one evening in every week under certain regulations; they encouraged correſpondencies with all parts of the kingdom; they ſubſcribed an annual ſum to defray the expence of engraving on copper-plates what ſhould be thought deſerving to be ſo preſerved, and limited their number to 100. And in this manner they continued their weekly meeting with great reputation, till his majeſty king George II. was graciouſly pleaſed to grant them a royal charter of incorporation, dated November 2, 1751, and to declare himſelf their founder and patron.

Under this charter they became a body corporate, by the name of the Society of Antiquaries of London, with a power to have and uſe a common ſeal, to ſue and be ſued, and to take, hold, and enjoy, by purchaſe, gift, or otherwiſe, any lands, tenements, or hereditaments, not exceeding in the whole one thouſand pounds per annum. And it is therein directed, that the council of the ſaid ſociety ſhall at all times conſiſt of twenty-one perſons, the preſident for the time being always to be one; and Martin Folkes, Eſq; was by charter appointed the firſt preſident, and alſo twenty other perſons therein named to be the firſt council, impowering them, within two months from the date thereof, to nominate, chooſe, and admit, as fellows of the ſaid ſociety, ſuch perſons as ſhould excel in the knowledge of the antiquities and hiſtory of this and other nations, and be eminent for piety, virtue, integrity, and loyalty. This firſt preſident and council were to continue till the 23d day of April next enſuing; on which day, in every year hereafter, the council and fellows aſſembled to nominate and elect a preſident and council for the enſuing year: and it was particularly directed that eleven of the former council ſhould be continued, and ten other perſons choſen out of the members of the ſociety; ten and no more of the council being to be changed annually. The preſident is impowered to nominate four perſons of the council to be his deputies, and ſupply his place, in caſe of ſickneſs or abſence; and the preſident, council, fellows, or any twenty-one or more, are impowered to make ſtatutes, rules, orders, and bye-laws, for the government and direction of the ſaid ſociety, their eſtates, goods, &c. and for the admiſſion and amoval of all and every the members and officers thereof. And the preſident, council, and fellows, may at any time appoint treaſurers, ſecretaries, and clerks, may have and employ one ſerjeant at mace, and ſuch other ſervants as they think neceſſary. And laſtly, if at any time abuſes or differences ſhould ariſe, the archbiſhop of Canterbury, the lord chancellor or keeper of the great ſeal, and the lord privy ſeal, and the two ſecretaries of ſtate for the time being, were appointed viſitors, with the full power for any three of them to compoſe and redreſs ſuch differences and abuſes. Proviſion is alſo made to fill up any vacancies that ſhould happen by the death of the preſident or any of the council.

On the receipt of this charter, the firſt preſident and council nominated and admitted, by a writing dated the 14th of November 1757, all the former members, together with ſome others, in the whole one hundred and twenty-one, to be fellows of the ſaid ſociety of antiquaries of London; and ſoon after drew up a body of ſtatutes for the good government thereof, which was unanimouſly agreed to and confirmed in the month of July 1752.

It was enacted, that the number of members ſhould not exceed one hundred and fifty; but that number being very ſoon filled up, and ſeveral men of quality and fortune, as well as perſons of great learning and eminence, being continually applying to become members, which they could not be till the vacancies ſhould happen by death, the ſociety thought proper, in the year 1755, to enlarge their number to one hundred and eighty (to which they are limited at preſent) excluſive of peers, privy-counſellors, and judges, that ſhould be choſen after that time. A little before this, the ſociety gave up the management of their eſtate and revenues, the payment of monies, and the publication of their papers and drawings, which were before in the body in general, and thereby attended with many inconveniencies, intirely to the care of their council, which are now a ſtanding committee for that purpoſe; and thereby the government of this ſociety is become nearly the ſame as that of the Royal Society, which was doubtleſs a proper pattern to copy after.

On the 23d of April, being St. George's day, the ſociety annually elect their council and officers, viz. a preſident, a treaſurer, two ſecretaries, and a director, who has the care of all their publications. Then the preſident appoints four of the council to be his deputies, or vice-preſidents: and after the election is over, the ſociety dine together at their own expence. Martin Folkes, Eſq; was annually elected preſident, till his death in 1754, ſince which time the Right Hon. Lord Willoughby of Parham was every year choſen till his deceaſe in 1765.

Every perſon deſirous to be elected a fellow of this ſociety, except peers, privy-counſellors, or judges

judges of Great Britain or Ireland, muſt be recommended by three or more of the members, in a paper ſigned by themſelves, ſpecifying the name, addition, profeſſion, and chief qualification of the candidate, and alſo the place of his abode. When this has been read at one of the ſociety's meetings, and then hung up in their public room, during the time of four other meetings, the election is determined by ballot. Peers, privy-counſellors, and judges of Great Britain or Ireland, if propoſed by any ſingle member, muſt be balloted for immediately. Every new member muſt pay an admiſſion-fee of five guineas, and ſign the obligation, whereby he promiſes that he will, to the utmoſt of his power, promote the honour and intereſt of the ſociety, and obſerve the ſtatutes and orders thereof; which being done, he is led up to the chair, when the preſident or vice-preſident riſing takes him by the hand, and ſays, "I do, by the authority and in "the name of the ſociety of antiquaries of Lon"don, admit you a fellow thereof."

Every member muſt further pay one guinea annually for the uſe of the ſociety, or ten guineas at once in lieu of all contributions.

The meetings of this ſociety are on Thurſday evenings weekly, from about ſix till nine o'clock, at their houſe in Chancery-lane. Their buſineſs is to receive, read, and conſider all informations from their own members or others, concerning the antiquities of all nations; (for which purpoſe they admit eminent foreigners to be correſponding members) but they more particularly attend to the ſtudy of the ancient hiſtory, cuſtoms, manners, grants, charters, coins, medals, camps, churches, cities, and all monuments whatever, eccleſiaſtical, military, or civil, which are found in or relate to Great Britain and Ireland; and the communications they have received concerning theſe matters muſt be very valuable, as may be judged by the many curious remains of antiquity they have cauſed to be engraved on copper-plates, and permitted lately to be ſold; though as yet they have not thought fit to publiſh any of their diſſertations. They have a ſmall but choice library, which is increaſing daily; alſo a fine collection of prints and drawings.

ANTIQUARY, a perſon who ſtudies and ſearches after remains of antiquity.

ANTIQUE, among architects, a building executed when architecture was in its utmoſt perfection among the ancient Greeks and Romans; that is, from the age of Alexander the Great to the reign of the emperor Phocas, about the year of Chriſt 600, when Italy was over-run by Goths and Vandals. Thus antique architecture is diſtinguiſhed from or oppoſed to ancient and modern architecture.

ANTIRRHINUM, calve's ſnout, or ſnap-dragon, in botany, a genus of didynamious plants, producing a monopetalous perſonated flower, divided into two lips, the upper one of which is bifid and reflexed on each ſide, the lower lip is trifid and obtuſe: the fruit is a roundiſh bilocular capſule, containing many angular ſeeds. Some ſorts of antirrhinum grow wild on the tops of old walls, where they make an agreeable appearance, and thrive much better than if cultivated in gardens.

ANTISAGOGE, in rhetoric, the ſame with conceſſion. See the article CONCESSION.

ANTISCII, in geography, people who inhabit different ſides of the equator, but may have different longitudes and latitudes. Thus the people of the north are antiſcii to thoſe of the ſouth, and their ſhadows are projected different ways.

ANTISCORBUTICS, among phyſicians, medicines good in all ſcorbutic caſes. See SCURVY.

ANTISEPTICS, among phyſicians, a name given to all ſubſtances that reſiſt putrefaction.

The word is formed from the Greek, ἀντὶ, againſt, and σήπω, to putrefy.

Dr. Pringle, in an appendix to his Obſervations on the Diſeaſes of the Army, has given a very curious and uſeful ſet of experiments on antiſeptics.

ANTISIGMA, among the ancient grammarians, implies a note or ſentence affixed to thoſe verſes whoſe order was to be changed.

ANTISTROPHE, in lyric and dramatic poetry, is the name of the ſecond ſtanza of the ancient ode and chorus, in ſinging of which the dance was inverted. Moſt of the odes, as well as tragic choruſes, were compoſed to be ſung; the former of theſe either at the entertainments given by the conquerors (to whom they were inſcribed) or by their friends on account of their victories, or at ſolemn ſacrifices made to the gods upon thoſe occaſions.

They conſiſted generally of three ſtanzas; the firſt of which was called ſtrophe, the ſecond antiſtrophe, and the third epode. When the ſtrophe was ſung, they danced to the right round the altar; and when the antiſtrophe was ſung, returned back again by the left. This is the reaſon why the ſtrophe and antiſtrophe conſiſted exactly of the ſame length and meaſure. When the dancers were returned from the place where they ſet out, before they renewed the dance they ſtood ſtill while the epode was ſung. Perhaps the ſtrophe and antiſtrophe, as it required ſo much breath to ſing and dance at the ſame time, were only a kind of recitative, while the epode was the more complete air. See EPODE and STROPHE.

ANTISTROPHE, in grammar or rhetoric, ſignifies a ſort of repartee, whereby two terms or things, mutually dependent on each other, are reciprocally inverted: it is a ſort of playing with the words; as in this line of Pope's,

Whom folly pleaſes, and whoſe follies pleaſe.

ANTITACTES, in eccleſiaſtical hiſtory, a name given to a branch of the Gnoſtics, who held that God was good and juſt, but that a creature had created evil: that we are therefore to oppoſe this author of evil, in order to avenge God of his enemy.

The word is derived from the Greek, *αντιτατειν*, to oppoſe.

ANTITHENAR, in anatomy, the name of a muſcle, generally called adductor indicis. See the article ADDUCTOR *Indicis*.

ANTITHESIS, in rhetoric, a figure of ſpeech, which conſiſts in oppoſing the thoughts to each other, in order to place their oppoſite qualities in a more conſpicuous point of light.

The witings of the ancients abound with this figure. Cicero, in his oration for Cluentius, ſays, *Vicit pudorem libido, timorem audacia, rationem amentia.*

ANTITHESIS, in grammar, is a figure whereby one letter is ſubſtituted in the room of another; as when Virgil ſays *olli* for *illi*, in order to make a kind of oppoſition.

ANTITHETARIUS, a term occurring in the title of a chapter of the laws of Canutus, but not in the chapter itſelf. It ſignifies a perſon who endeavours to acquit himſelf of the crime laid to his charge, by charging his accuſer with the ſame fact.

ANTITRAGUS, in anatomy, the part of the external ear oppoſed to the tragus. See EAR and TRAGUS.

ANTITRINITARIANS, is a general name given to thoſe who deny the myſtery of the trinity, that there are three perſons, and but one God. Under this title are comprehended the Macedonians and Samoſatians, but more particularly the Arians and Socinians. See ARIAN and SOCINIAN.

ANTITYPE, a word which is taken from the Greek, and ſignifies a *pattern*, *model*, *example*, &c.

There are two places in the New Teſtament, where this word occurs, which have occaſioned ſome doubt and diſputation amongſt commentators. One is in the epiſtle to the Hebrews, ix. 24. where the word *αντιτυπα* is rendered *figures*; "Chriſt is not "entered into the holy places made with hands, "which are *figures* of the true." It does not ſeem in this place to be well tranſlated: the apoſtle in this chapter had been drawing a compariſon between Chriſt and the high-prieſt, who entered into the holy of holies once a year, not without blood, to make an atonement for the ſins of the people: he then ſays, that our Saviour is not entered into the holy of holies, which was made with hands, as that of the tabernacle was; for this was only---What? An antitype, a place built after the model, of the true: for God commanded Moſes (Exod. xxv. 40.) to make the tabernacle after the model that was ſhewn him in the mount.

In the firſt epiſtle of St. Peter, iii. 21. baptiſm is called the antitype of the ark, becauſe in *that* ſome were ſaved by water. This is by no means clearly tranſlated in our verſion; "The like *figure* where-"unto, even baptiſm, doth alſo now ſave us." The whole paſſage would have been better rendered thus: "While the ark was preparing, wherein a "few, that is, eight ſouls, were ſaved by water: "in imitation of which (*ω αντιτυπον*) or as a re-"ſemblance of which, baptiſm doth even now ſave "us." The ark was the type or figure, baptiſm was the antitype or accompliſhment of that figure.

The word antitype was frequently made uſe of in the Greek church, to ſignify the bread and wine after conſecration.

ANTLER, among ſportſmen, implies a ſtart or branch of a deer's horn.

Brow ANTLER ſignifies the branch next the head.

Bes ANTLER, the branch next above the brow antler.

ANTŒCI, in geography, are thoſe people which live on the ſame meridian on different ſides of the equator, but at equal diſtances; conſequently, if their latitudes be greater than the ſun's declination, their ſhadows will be projected different ways. They have noon at the ſame time, but it is winter with one when it is ſummer with the other; and the night of one is equal to the day of the other. If the antœci both turn their faces towards the equator, the ſtars and planets will riſe to one on the right hand, and to the other on the left.

ANTONIAN *Water*, in the materia medica, the name of a medicinal water of Germany, remarkably pleaſant to the taſte, and of ſervice in many caſes as a medicine.

It is very temperate, not too ſtrongly operating either by ſtool or urine: and hence it is a very proper drink for perſons in chronic and many acute diſeaſes, either alone, or mixed with wine, to ſupply the place of malt liquor, which is proper but in very few diſeaſes. A long uſe of it alone may alſo prove of conſiderable ſervice in hypochondriac caſes. *Hoffman.*

ANTONOMASIA, in rhetoric, a figure by which the noun appellative is uſed inſtead of a proper name, and the contrary.

The word is compounded of the Greek, *αντι*, for, and *ονομα*, a name.

Thus, becauſe Sardanapalus was a voluptuous prince, and Nero a cruel emperor, we give an epicure the name of Sardanapalus, and a barbarous prince the appellation of Nero.

ANTRUM *Highmorianum*, in anatomy, is a cavity diſcovered in the maxillary bone, called alſo ſinus maxillaris.

ANTRUM *Pylori*, in anatomy, is a large cavity at the bottom of the pylorus. See PYLORUS.

ANUBIS, in mythology, a name given to Mercury,

cury, who was worſhipped by the Egyptians under the figure of a dog.

Diodorus Siculus tells us, that Anubis, following his father Oſiris to war, bore the enſign of a dog on his ſhield; for which reaſon he was worſhipped, after his death, under the figure of a dog.

ANVIL, in mechanics, is an inſtrument on which the ſmith hammers or forges his work. The uppermoſt face of the anvil ſhould be very flat and ſmooth, and ſo hard that a file will not penetrate it; it is generally placed on a large wooden block; at one end there is ſometimes a round pike, or beak-iron, for the rounding of hollow work, or bending iron into different curves.

ANUS, in anatomy, the extremity of the inteſtinum rectum, or orifice of the fundament. It is ſurrounded with a large quantity of fat, that it may eaſily dilate in diſcharging its contents, and is furniſhed with three muſcles, called elevatores and ſphincter. See SPHINCTER.

ANUS is alſo the name of a ſmall aperture in the third ventricle of the brain, leading to the fourth ventricle of the cerebellum.

AONIDES, in mythology, one of the many appellations of the muſes, ſo called from the Aonian mountains in Bæotia, where they were feigned to reſide.

AORASIA, in antiquity, the inviſibility of the gods.

The word is Greek, ἀοραϛια, and derived from ἀ, priv. and ὁραω, to ſee.

The opinion of the ancients, with regard to the appearance of the gods to men, was, that they never ſhewed themſelves face to face, but were known from their backs as they withdrew: whence it followed, according to them, that every being they had time to look at in the face, was not a deity. Neptune aſſumed the form of Calchas to ſpeak to the two Ajaxes; but they knew him not till he turned his back to leave them; and diſcovered the god by his majeſtic ſtep, as he went from them. Venus appeared to Æneas in the character of a huntreſs; but her ſon knew her not till ſhe departed from him; her divinity was betrayed, if we may uſe the word, by her radiant head, her flowing robe, and her majeſtic pace.

AORIST, in the Greek and French grammars, is the name of a tenſe, which denotes the preter indefinite, or indeterminate. The word is compounded of ἀ priv. and ὁρϑ-, a limit. Thus, *I have made*, is the preterperfect tenſe, becauſe it ſpeaks abſolutely; *I made*, is the aoriſt, becauſe it is not determinate, for there wants a word to fix the time, as, I made *yeſterday*.

The aoriſt is not made uſe of, except in ſpeaking of a time diſtinct from the preſent: thus, if we would expreſs ourſelves with propriety, we ſhould ſay, I *read* Plutarch formerly; and, I *have read* Plutarch this morning; becauſe this morning is looked upon as part of the preſent day.

AORTA, in anatomy, the great artery which riſes immediately from the left ventricle of the heart, and thence diſtributed to all parts of the body. It is divided into two grand trunks, diſtinguiſhed by the epithets aſcending and deſcending. See the article ARTERY.

APAGOGICAL *Demonſtration*, implies an indirect method of proving the truth of a propoſition, by ſhewing the abſurdity of the contrary.

The word is formed from the Greek, ἀπο, from, and ἀγω, to bring, or draw.

APANAGE, or APENNAGE, in the French cuſtoms, are lands aſſigned by the ſovereign for the ſubſiſtence of his younger ſons, and which revert to the crown upon failure of male iſſue in that branch to which the lands were granted.

APARINE, gooſe-graſs, or clivers, in botany, a plant with a ſlender fibrous root, and thin, quadrangular, rough, jointed, climbing ſtalks. At every knot there are placed five or ſeven narrow rough leaves in the form of a ſtar; the flower is campanulated and monopetalous, containing four ſubulated filaments; the fruit, when ripe, is dry, covered with a blackiſh ſkin, conſiſting of two globoſe berries joined together, and containing ſingle roundiſh ſeeds. This plant grows wild in many places, and flowers in May or June: it is ſaid to be warm and dry, and is recommended in cachexies, promoting both urine and ſweat. The juice of this plant is efficacious in dropſical diſorders, evacuating the water by urine.

APARTMENT, a portion, or part of an houſe, containing the neceſſary conveniencies for a perſon to reſide in it.

APATHY, among the ancient philoſophers, implied an utter privation of paſſion, and an inſenſibility of pain.

The word is compounded of ἀ, priv. and ϖαϑ-, affection.

The Stoics affected an entire apathy; they conſidered it as the higheſt wiſdom to enjoy a perfect calmneſs or tranquility of mind, incapable of being ruffled by either pleaſure or pain.

The primitive Chriſtians uſed the word to expreſs a contempt for the things of this world.

APATURIA, in antiquity, a ſolemn feaſt celebrated by the Athenians in honour of Bacchus.

APE, in natural hiſtory, the Engliſh name of an animal of the monkey kind. See MONKEY.

A-PEEK, in the marine, the anchor is ſaid to be a-peek when ſo much of the cable is drawn into the ſhip as to bring her perpendicularly over the ſpot on which the anchor is laid.

APELLITES, the name of a ſect of heretics who ſprang up in the ſecond century, and ſo called from their founder Apelles, who was a diſciple of Marcion. They maintained that Chriſt had only a bodily

a bodily appearance, but not a real body of fleſh and blood: that when he deſcended from heaven he took upon him an aerial form, which at his aſcenſion diſſolved again into air. They denied the reſurrection of the body, and profeſſed the ſame doctrine as the Marcionites.

APEPSY, *Apepſia*, among phyſicians, implies crudity, or a want of digeſtion.

The word is Greek, and compounded of α, priv. and πεπτω, to concoct.

APERIENS *Palpebram rectus*, in anatomy, a muſcle in the eye-lid. It ariſes ſharp and fleſhy from the profoundeſt part of the orbit, near the place where the optic nerve is tranſmitted, paſſing directly over the muſculus attollens; it becomes tendinous, as it marches over the ball of the eye; whence it ſtill grows broader and thinner, till it is inſerted into the whole ſuperior part of the upper eye-lid.

APERIENTS, in the materia medica, ſuch medicines as facilitate the circulation of the juices in their containing veſſels, by removing all obſtructions. See the article DEOBSTRUENTS.

APERTURE, in general, ſignifies the opening of any thing; or a hole, cleft, or vacant place in ſome continuous ſubject.

APERTURE, in geometry, is the opening of two right lines, which inclining towards each other, meet in a point, and form an angle, which is called the aperture; or the angle contained between the two legs of a pair of compaſſes, when opened to any radius, is properly called the aperture.

APERTURE, in architecture, are doors, windows, chimneys, &c. It is a rule among good architects to have as few apertures as conveniency will admit, becauſe the ſtrength of the building is diminiſhed in proportion to the number of apertures.

APERTURE, in optics, is a hole next the object glaſs of a teleſcope, microſcope, &c. through which the light and image of the objects are tranſmitted down the tube to the eye. The diameter of this aperture or hole, (which is moſtly cut in a ſmall piece of wood, braſs, tin, &c. fitted to the ſhape of the tube) is beſt determined by practice; as all theory will be found to vary from the truth, for different object glaſſes of the ſame dimenſions are found to require different apertures, as well as different objects, according as they are more or leſs luminous: however, it may not be amiſs to approach as near as poſſible by theory, and complete the aperture by obſervation and experiment. Thus, for example, to find the aperture nearly, ſay, As 10 is to 1, ſo is the ſquare root of the diſtance of the focus of any glaſs multiplied by 30, to its aperture; then having provided yourſelf with ſome paſte-board paper made black, and cut in circular pieces, with apertures gradually diminiſhing and increaſing in diameter from the aperture found by the above proportion, place them on the object glaſs, and by looking at any object, you will quickly find which ſhews the object moſt diſtinct. Likewiſe by trying at different objects, (as the planets) you may find which aperture ſuits beſt for each; and by marking each paper aperture, have them always at hand to uſe according to the object you would view. The diameter of the aperture of an object glaſs, by being made of different lengths, does not increaſe or diminiſh the area of the object, but ſhews it to the eye more or leſs diſtinct, by admitting a quantity of luminous rays which obſcures the object, by reaſon that the great glare dazzles the eye.

APERTURE, is alſo underſtood of that part of the object-glaſs itſelf which covers the former, and which is left pervious to the rays. See TELESCOPE.

APETALOUS, among botaniſts, a term given for thoſe flowers which are deſtitute of corolla or petals.

APEX, in geometry, the ſame vith vertex. See VERTEX.

APHACA, in botany, a kind of vetch claſſed by Linnæus amongſt the lathyrus. See the article LATHYRUS.

APHÆRESIS, in grammar, is a figure by which a letter or ſyllable is cut off from the beginning of a word.

APHANES, in botany, a genus of plants producing apetalous flowers with two egg-ſhaped germen, and two ovated acuminated ſeeds approaching nearly to the alchimilla.

APHEA, in mythology, a goddeſs worſhipped by the Cretans and people of Ægina.

Aphea, before ſhe was made a deity, went by the name of Britomartis in Crete. Her paſſion for hunting attached her to the train of Diana, and dedicated her virginity to the goddeſs; to avoid the purſuit of Minos, who was deſperately in love with her, ſhe threw herſelf into the ſea, and was taken up in the nets of ſome fiſhermen. Diana rewarded her virtue with the honours of immortality. Britomartis afterwards appeared to the people of Ægina, who paid adoration to her under the name of Aphea.

APHELION, in aſtronomy, is that point in the elliptic orbit of any planet, which is at the greateſt diſtance from the focus of the ellipſe, or that point where the planet is at its greateſt diſtance from the ſun. Thus ſuppoſe A H P (Plate X. *fig.* 1.) to be the elliptic orbit of any planet, C, the center, and S, the focus or ſun; then the point A, which is at the greateſt diſtance from S, is called the aphelion, in oppoſition to P, the perhelion, which is the neareſt point in the orbit to S the focus, or place of the ſun.—Every planet moves quickeſt when in or near the perhelion, and ſloweſt when in the aphelion. Likewiſe their apparent diameters are

are leaſt when in the aphelion, and greateſt in the perhelion, which things being accurately obſerved, it will be eaſy to find their places, and conſequently their motion. The nature and method of making calculations from ſuch obſervations may be ſeen in De la Caille's Practical Aſtronomy. Likewiſe Dr. Halley has given a ſtrict geometrical method of finding the planets aphelion in the Philoſ. Tranſ. N°. 128.——Sir Iſaac Newton has proved that the aphelia of the primary planets are at reſt; ſee Principia Prop. 14. lib. 3. and in the ſcholium to the ſame propoſition, he ſays that the planets neareſt the ſun, viz. Mercury, Venus, the Earth, and Mars, from the action of Jupiter and Saturn upon them, move a ſmall matter in conſequentia with regard to the fixed ſtars, and that in the ſeſquiplicate ratio of their reſpective diſtances from the ſun. Hence, if the aphelion of Mars move 35 minutes in conſequentia, or, according to the order of the ſigns, in 100 years, that of the Earth, Venus, and Mercury, will move in the ſame time 18′ 36″, 11′ 27″, and 4′ 29″.

Kepler and De la Hire place the aphelia for the year 1700, as below, as well as their annual motion:

KEPLER's.

	Place of the Aphelion.					Ann. Mot.	
		°	′	″		°	″
♄	in	28	3	48	of ♐	1	10
♃		8	10	40	♎	1	47
♂		0	51	29	♍	1	7
♀		3	24	57	♒	1	18
☿		8	25	30	♑	1	45

DE LA HIRE's.

	Place of Aphelion.					Ann. Mot.	
		°	′	″		°	″
♄	in	29	14	41	of ♐	1	22
♃		10	17	14	♎	1	34
♂		0	35	25	♍	1	7
♀		6	56	10	♒	1	26
☿		31	3	40	♑	1	39

APHONIA, among phyſicians, implies a loſs of voice or ſpeech.

The word is Greek, and is compounded of α, priv. and φωνη, voice.

APHORISM, a maxim, or principle of ſome ſcience; or a ſentence comprehending, in a few words, a great deal of matter.

The word is formed from the Greek, αφορισμος, and derived from αφοριζω, to chuſe, or ſeparate.

APHRODISIA, in antiquity, feſtivals in honour of the goddeſs Αφροδιτη, or Venus. There were ſeveral of theſe Aphrodiſia obſerved in divers parts of Greece; the moſt remarkable was that at Cyprus, firſt inſtituted by Cinyras, out of whoſe family certain prieſts of Venus were elected; and for that reaſon named κινυραδια. At this ſolemnity ſeveral myſterious rites were practiſed: all who were initiated to them offered a piece of money to Venus as an harlot, and received, as a token of the goddeſs's favour, a meaſure of ſalt, and a φαλλος; the former becauſe ſalt is a concretion of ſea-water, to which Venus was thought to owe her birth; the latter, becauſe ſhe was the goddeſs of wantonneſs.

APHRODITE, a name of Venus.

The word is Greek, and derived from αφρος, foam; becauſe, according to the poets, Venus ſprung from the foam of the ſea.

APHRODITES, in natural hiſtory, a name given by ſome authors to the fineſt ſpecies of amethyſt.

The ancients had a way of diſtinguiſhing what they allowed to be gems, into ſeveral kinds, according to their degrees of colour: theſe they called ſo many ſpecies, and gave to each its particular name. This has been the occaſion of no little confuſion among the writers on theſe ſubjects, by ſeemingly enlarging the number of gems. The pæderos and gemma veneris of the ancients are the ſame ſtone with this, though many have applied theſe names to the opal.

APHRONITRE, in natural hiſtory, a name given by the ancients to a particular kind of natron, or native nitre; ſuppoſed to be the froth or ſpume emerging on the ſurface of nitre in fuſion.

The word is formed from the Greek αφρονιτρον, and compounded of αφρος, froth, and νιτρον, nitre.

APHTHÆ, in medicine, ſmall round ſuperficial ulcers ariſing in the mouth.

The word is derived from the Greek, απτω, to inflame.

Mel roſatum, or honey of roſes, acidulated with ſpirit of vitriol, is a good medicine in the cure of the aphthæ.

APHYLLANTHES, the blue Montpelier pink, in botany, a genus of plants containing hexapetalous flowers with ſix filaments; the capſule is turbinated and triangular, containing oval ſeeds.

APIARY, a bee-houſe, or place where bees are kept, and properly furniſhed with all the apparatus neceſſary for that purpoſe.

The word is formed from the Latin, *apis*, a bee.

Methods of making an APIARY.—When there are but few bees, it is uſual to ſet them in any corner of the garden, or court, and ſometimes in cloſes adjoining to the houſe; though ſome, for want of room without doors, have ſet them in

lofts or upper rooms; but this is not ſo proper for them. If a perſon intends to have a conſiderable ſtore of bees, a ſquare plat muſt be made by itſelf, proportioned to the number of bees intended to be kept, not quite a ſquare, being rather longer extended from eaſt to weſt, but ſo contrived that they may have as much of the morning and evening ſun as poſſible. The apiary ſhould be ſecurely defended from high winds on either ſide, either naturally by hills, trees, &c. or artificially by houſes, barns, walls, &c. It is alſo to be well fenced from cattle, eſpecially hogs, and from all ſorts of fowl, their dung being very prejudicial to them; neither ſhould there be any ill ſmells, nor any poultry kept near the place. The apiary ſhould be furniſhed with ſtools or benches of wood or ſtone; but the firſt is beſt, ſtone being hot in ſummer, and cold in winter: theſe are placed at different heights, but about twelve inches is a good height; they ſhould be ſet a little ſhelving, that the rain may run off; they ſhould alſo be two or three inches wider than the hives ſet upon them, and at leaſt five feet diſtant from the other.

To have a compleat apiary, for every ſtock of bees intended to be kept, make a cot or houſe about two feet ſquare, and two and a half high, ſet on four legs about ten inches above the ground, covered over with boards or tiles to keep off the rain, the back or north ſide being cloſed up; and the ſides, facing the eaſt and weſt, to have doors with latches and haſps to them; the fore or ſouth ſide to have a falling-door to cover one half thereof, which is to be raiſed up at pleaſure; and in ſummer-time ſerves for a pent-houſe, not only to keep off the beating rains from the hives, but to defend them from the extreme heat of the ſun, which at noon-day is apt to melt the honey. The other lower half ſhould have two ſmall doors to open to either hand, which will ſerve to defend the doors or holes of the hives from injurious winds: all the doors may be faſtened in winter, when the weather is too cold; or in ſummer, when it is too hot for the bees, only making a little open ſquare at the bottom of the little doors againſt the bee-hole, that the bees may have ſome liberty to fly abroad, after the doors have been ſhut: by means of the ſide doors, eſpecially if the weſt door be made to open to the right hand, a perſon may ſit ſafe, and ſee the ſeveral workings of the bees in glaſs hives, if any ſuch are uſed; if not at theſe places he may order, view, and obſerve them better than when they ſtand on naked ſtools, and with leſs offence to the bees, and more ſecurity to himſelf.

In the winter ſeaſon, if the apiary ſtand cool, good ſweet ſtraw may be ſtuffed within the doors about the hives, to keep them warm; but extremity of cold does not hurt bees ſo much in winter as wet, from which theſe caſes beſt preſerve them; or as light, and the warm beams of the ſun, at ſuch time when there is no proviſion abroad for them, againſt which this houſe or cot is the beſt preſervative; for, when the doors are ſhut, though the ſun ſhine, yet they are inſenſible of it, the hives ſtanding ſix or eight inches within the doors; whereas, after the common way of benches or ſtools, the ſun caſts rays to their very doors, which warmth and light together, draw them out, at the expence of their proviſions and lives together, as is evident from frequent experience, the mildeſt and cleareſt winters ſtarving and deſtroying moſt bees; when, on the contrary, the coldeſt and moſt frozen beſt ſecure them. See the article BEE.

APICES, in botany, are the knobs which grow on the tops of the filaments of flowers, containing the male duſt, which, when ripe, fecundates the oviary, rendering it prolific, and is the ſame as antheræ. See ANTHERÆ.

APIOS, the knobbed-rooted Virginian liquorice vetch, in botany. See GLYCINE.

APIS, in mythology, a famous deity among the Egyptians, repreſented by an ox, with certain external marks. Into this animal, according to the Egyptians, the ſoul of the Great Oſiris retired, and withdrew itſelf from the world. He gave this creature the preference, becauſe the ox is the ſymbol of agriculture, the perfection of which this prince had very much at heart.

The ox apis muſt have a ſtar in the forehead; that is, a ſquare white mark, the figure of an eagle on his back, a knot under his tongue in the form of a beetle, the hair of his tail double, and a creſcent on his right flank; and the cow that bore him muſt have conceived by a clap of thunder.

As it is difficult to apprehend nature ſhould produce an animal with all theſe marks, requiſite for an apis, we muſt ſuppoſe that the prieſts took care, by impreſſing the neceſſary marks on young calves, to be provided always with one: and if it happened at any time an apis could not immediately be found, and they were obliged to put it off for ſome time, it was certainly becauſe they were very careful not to be thought guilty of the impoſition. But this artifice ſeems needleſs; people, on theſe occaſions, voluntarily ſhut their eyes. When they had found the apis, before they carried him to Memphis, they fed him forty days in a city on the Nile. Women only were permitted to ſee and wait upon him, and theſe were obliged to preſent themſelves before the divine ox in an undreſs. After theſe forty days, they put him on board a ſuperb veſſel, and brought him down the Nile to Memphis, where the prieſt received him with all imaginable pomp; they were attended by numbers of people, and children were happy who could ſmell his breath, becauſe they imagined it inſpired them with the gift of prophecy.

On his arrival at Memphis, they conducted him to the temple of Oſiris, wherein were two magnifi-

cent ſtalls; one of which was built by Pſammeticus, ſupported by ſtatues, after the manner of the Coloſſus, twelve cubits high: here he continued almoſt always ſhut up, being hardly ever ſeen but by ſtrangers, to whom he was ſhewn in a little meadow joining to the temple. If they at any time led him about the city, he was attended by officers to keep off the croud, and accompanied by young children who ſung his praiſes.

APIUM, in botany, the name of an herb called in Engliſh parſley. See PARSLEY.

APIUM *Paluſtre*, ſmallage. See the article SMALLAGE.

APIUM *Macedonicum*. See BUBON.

APIUM *Pyrenaticum*. See CRITHMUM.

APOBATERION, a Greek word which ſignifies a farewel diſcourſe. Among the ancients this term ſignified any poem, compliment, or ſpeech, which a perſon, upon quitting his own country, or any foreign land, addreſſed to his relations, or any friends, amongſt whom he had been kindly and hoſpitably treated. Such is the farewel which Æneas takes of Helenus and of Andromache, in the third book of the Æneid.

On the contrary, the firſt ſalutation which a perſon made, upon entering a foreign country, or returning from a journey home, was called epibaterion. See EPIBATERION.

APOCALYPSE, the Revelations, a name given to one of the ſacred books of the New Teſtament, written by St. John, and containing revelations concerning ſeveral important points of Chriſtianity.

The word is derived from the Greek, αποκαλυπτω, *I reveal*.

It contains twenty-two chapters, which treat of the ſtate of the church from the aſcenſion of Chriſt till the laſt judgment, and are as it were the concluſion of the Holy Scriptures. Theſe Revelations were made by St. John the Evangeliſt, during his exile in the iſle of Patmos, whither he was baniſhed by the emperor Domitian. The concatenation of ſublime and prophetic ideas which compoſe the Apocalypſe, has ever been a labyrinth in which the brighteſt geniuſes have been loſt and bewildered, and the ableſt commentators ſo puzzled and entangled, that it is with the utmoſt difficulty they could extricate themſelves out of it. The many frivolous explanations which they have given of ſome parts, and the wild reveries they have been thrown into by conſidering others, is enough to mortify the wit of man, and teach it not to graſp at things ſo far beyond its comprehenſion. However, dark and ænigmatical as the greateſt part of it is, enough of this prophecy has already been fulfilled to afford ſufficient inſtances of God's divine providence. Many Proteſtant writers have been of opinion that Rome is frequently alluded to, under the name of Babylon, the great ſcarlet whore, ſeated on ſeven hills.

There have been great diſputes in the firſt ages of the church whether this book ſhould be eſteemed authentic and canonical. Some pretend that it is the work of Cerinthus, who made uſe of the name of St. John, to give a weight to his wild and fantaſtic viſions. Others ſay that it was written by a perſon named John, but not by St. John the Evangeliſt. But there will be little reaſon to doubt of its authenticity, if we conſider, 1ſt, That St. John the Evangeliſt is plainly marked out in theſe words, "Who bare record of the word of God, and of the teſtimony of Jeſus Chriſt, and of all things that he ſaw." 2dly, That it is addreſſed to the churches of Aſia, of which St. John had the government. 3dly, That it is written from the iſle of Patmos, whither Iræneus, Euſebius, and all the ancients agree that St. John was baniſhed in the year 95, and returned from thence in the year 98. 4thly, That many writers who lived near the time of the apoſtles, ſuch as Juſtin, Irenæus, and Origen, and after them a whole tribe of fathers, attributed it to St. John the Evangeliſt.

As to its being canonical, though doubted of, as St. Jerom informs us, by many churches in Greece, yet it has been quoted and acknowledged as ſuch by Juſtin, Irenæus, Origen, Cyprian, Clemens of Alexandria, and all the fathers of the fourth, fifth, and following centuries.

There have been many other books of Revelations. Clemens ſpeaks of the Apocalypſe of St. Peter: there is mention made of another of St. Paul: Euſebius ſpeaks of one of Adam: Epiphanius of another of Abraham: Gratian of one of Moſes: Jerom of one of the prophet Elias, &c. &c. &c.

APOCLYSMA, in pharmacy, the ſame with rob. See the article ROB.

APOCOPE, the name of a figure in rhetoric, which cuts off a letter or ſyllable from the end of the word, as *negoti*, for *negotii*, &c.

The word is compounded of the Greek, απο, from, and κοπτω, I cut.

APOCRASIARIUS, in antiquity, an officer who delivered the meſſages of the emperor. He was afterwards chancellor, and kept the ſeals.

APOCRUSTICS, in pharmacy, the ſame with repellents. See REPELLENTS.

APOCRYPHA, in its original ſignification, implies hidden. It is compounded of the Greek απο, from, and κρυπτω, I hide.

This term apocrypha has been made uſe of a long time by eccleſiaſtical writers, to ſignify books that are doubtful and ſuppoſititious, as one may ſee in St. Jerom, and many other of the fathers Greek and Latin. In this ſenſe it was adopted from the Jews,

Jews, who called only ſuch of their ſacred books canonical as had been made public; to thoſe that ſtill remained in their archives, they gave the appellation of apocryphal.

The books that are reckoned apocryphal by our church, are the book of Tobit, Judith, Eſther, the book of Wiſdom, Jeſus the ſon of Sirach, Baruch the prophet, the ſong of the Three Children, the hiſtory of Suſannah, the hiſtory of Bel and the Dragon, and the firſt and ſecond book of Maccabees; as well as thoſe that are eſteemed ſuch by the church of Rome, viz. the prayer of Manaſſeh king of Judah, the third and fourth book of Eſdras, St. Barnabas's epiſtle, the book of Hermos, the addition at the end of Job, and the 151ſt Pſalm.

It is no wonder that the Romiſh church adopted thoſe books that are regarded by us as apocryphal, into the number of their canonical writings, as they have been ſo extremely ſerviceable to them, in ſupporting, I ſhould have ſaid in giving a gloſs to certain tenets and doctrines, for which they could not have found the very ſhadow of a reaſon in the other Scriptures. Happily for us we have no occaſion for their aſſiſtance; and have always looked upon them as apocryphal; as they were not to be found in the catalogues of the canonical books of Scripture that have been given us by Origen, Athanaſius, Hilary, Cyril of Jeruſalem, and all other orthodox writers, and beſides were utterly unknown to the Chriſtian church for ſome ages. No books but ſuch as have been cited by the earlieſt writers in ſupport of Chriſtianity, and approved by the council of Laodicea, are regarded by Proteſtants as of divine authority.

APOCYNUM, dogs-bane, in botany, a genus of plants, whoſe leaves are produced oppoſite in pairs on the branches. The flower is monopetalous and campanulated, cut into five parts at the brim. In the bottom of the flower are five corpuſcular nectariums, which are oval and ſurround the germen. The filaments are five in number, and very ſhort, which are topped with oblong erect antheræ. In the center are placed two egg-ſhaped germen, which ſupport two ſtyles, ſcarce viſible: the germen afterwards becomes a fruit or pod, which opens from the baſe to the top, incloſing many ſmall compreſſed ſeeds having a long pappous down adhering to them.

The down of ſome ſorts of theſe plants are much uſed in France for ſtuffing eaſy chairs, it being extremely light and elaſtic: it is alſo uſed in quilts, which are very warm; on which account there are ſeveral plantations of apocynums raiſed in the ſouthern parts of that kingdom. All the ſpecies of the apocynums abound plentifully with a milky juice.

APODICTICAL *Argument*, or *Syllogiſm*, implies a clear convincing proof of a propoſition. The word is formed from the Greek, ἀποδείκνυμι, to demonſtrate.

APODOSIS, in rhetoric, the ſame with axioſis. See AXIOSIS.

APODYTERIUM, in the ancient baths, the apartment where perſons dreſſed and undreſſed.

The word is Greek, ἀποδυτηριον, and derived from ἀποδυω, to undreſs.

APOGEE, or APOGÆUM, in aſtronomy, is that point in the orbit of a planet which is at the greateſt diſtance from the earth, according to ancient aſtronomy, when the earth was placed in the center of the ſyſtem; but ſince the moderns have placed the ſun in the center, they have changed the terms apogæum and perigæum into aphelion and perhelion for the planets ♄ ♃ ♂ ♀ ☿, but retain them for the ſun and moon.

APOGEE *of the Moon*, is that point of the moon's orbit which is at the greateſt diſtance from the earth; as in Plate XI. *fig.* 1. where BPAD repreſents the elliptic orbit of the moon, in which it moves round the earth T, which is placed in the focus of the ellipſe. The point A, which is the higheſt apſis, is called the apogee, or apogæon of the moon.

This apogæum of the moon has an unequal motion, and ſometimes moves backwards and ſometimes forwards: when it is coincident with the ſyzygial line, its motion is forwards; but when it cuts that line at right angles, its motion is backwards, and its progreſs and regreſs are no ways equal. But when the moon is in her quadratures with the ſun, the apogæum goes but ſlowly forward, or even may ſtand ſtill, or go backwards; but when the moon comes to be oppoſite, or conjoined to the ſun, the apogæum has a quick motion forward.

The cauſe and quantities of theſe motions have been demonſtrated by Sir Iſaac Newton's Univerſal Law of Gravitation; namely, *that its force is in an inverſe ratio of the ſquare of the diſtance.*

But Mr. Clairaut, in a memoir which he read to the academy in the year 1747, pretends to have found by his calculations, that this law of Sir Iſaac's would give only one half of the motion of the moon's apogee, which aſtronomers have diſcovered by their obſervations: from whence he concludes, that it was neceſſary to change this law by adding ſomething to correct its inſufficiency. However, this memoir was overturned by a pamphlet written by Mr. Walmſley, and the above law again eſtabliſhed, and Mr. Clairaut made ſenſible of the error he had made in his calculations. The method of calculating the motion of the moon's apogee may be ſeen in the above-mentioned pamphlet, with a demonſtration of Machin's Theorem, for the ſame purpoſe.

APOGEE *of the Equant* is the fartheſt diſtance from

Fig. 1. Apogee.

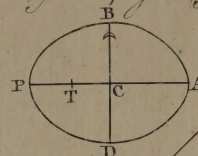


Fig. 2. Apparent Diameter.

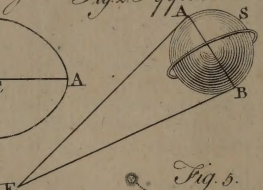


Fig. 3. Apparent Magnitude.

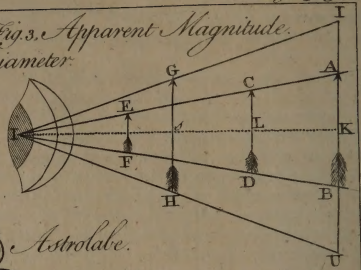
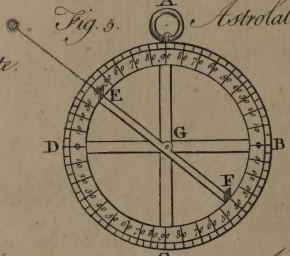
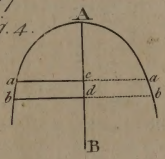


Fig. 5. Astrolabe.



Applicate Ordinate.

Fig. 4.



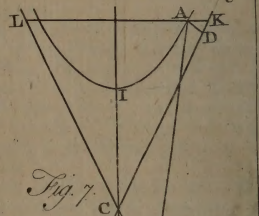


Fig. 7. Asymptotes.

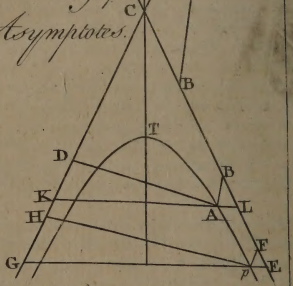


Fig. 6. Asymptotes.

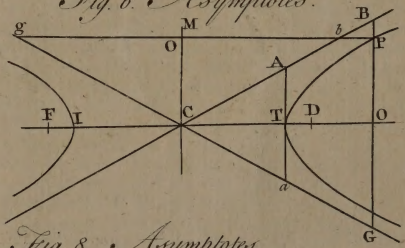


Fig. 8. Asymptotes.

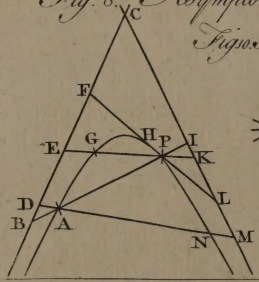


Fig. 10. Asymptotes.

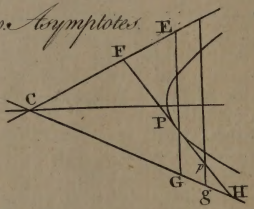
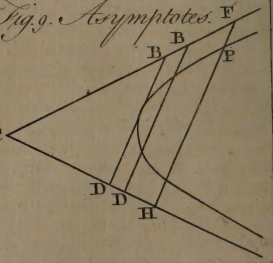


Fig. 9. Asymptotes.



from the earth, or that point where the circumference of the equant is intersected by the line of the apsides, in the remotest part of the diameter.—The mean apogee of the epicyle is a point where the epicycle is cut above by a right line drawn from its center to the center of the equant, or the point where the epicycle is most remote from the earth.

APOGEE *of the Sun* is the point of the earth's orbit which is the greatest distance from the sun; and consequently the sun's apogee and the earth's aphelion are the same point.

To find the place of the sun's apogee, observe the sun's right ascension, relative to a known star, when it is near the times of its greatest and least velocity. Its longitudes are deduced by seeking the two places, and the times when the sun comes to two points, at the distance of 180° 0′ 31½″, in the middle of its semi-anomalistic revolution, which is 182 days, 15 hours, 7 minutes, and 1 quarter of a minute. One of these points is the earth's aphelion, and called the sun's apogee, because the earth's motion is attributed to the sun; the other, its perihelion, and called the perigee of the sun.

For example: On the 30th of December 1743, at 0^h 3′ 7″ mean time, the longitude of the sun was found by means of the star Arcturus, to be 8° 29′ 12½″ in ♑; and on the 30th of June 1744, at 0^h 3′ 0″, it was 8° 51′ 1½″ in ♋. The difference of these two places is 180° 21′ 49″, which exceeds 180° 0′ 31½″ by 21′ 17½″; but the sun describing 57′ 12″ *per* day, about the 30th of June; therefore, on the 30th of June at 3^h 6′ 49″ in the morning, the sun must have been in 8° 29′ 43″ of Cancer, at 180° 0′ 31½″ from the place where it was on the 30th of December at 0^h 3′ 7″ at night. The interval of time is 182 days, 15 hours, 3 minutes, 42 seconds, which is 3′ 33″ less than the half anomalistic revolution of the sun; therefore, on the 30th of June, at 3^h 6′ 49″ in the morning, the sun had not yet passed through the apogee. Saying then, As 4′ 0″, the difference between the diurnal motions of the sun on the 30th of June and on the 30th of December, is to 57′ 12″, its diurnal motion on the 30th of June; so is 3′ 33″ to 50′ 46″, which added to 3^h 6′ 49″, gives the sun's passage through the apogee, on the 30th of June, at 3^h 37′ 55″ in the morning, at which instant the sun was in 8° 31′ 35″ of Cancer; therefore, the sun's apogee, was in 3 signs, 8 degrees, 31 minutes, and 35 seconds. See *De la Caille's Astronomy*.

The annual motion of the sun's apogee is found by accurate observations to be 1′ 6″.

APOLLINARIAN *Games*, in antiquity, an appellation given to certain theatrical entertainments annually performed in honour of Apollo.

APOLLINARIANS, or APOLLINARISTS, a name given to the followers of Apollinaris, who in the fourth century was bishop of Laodicea. He maintained that Christ had no soul, but that his divinity was to him instead of one. Sometimes he confessed that our Saviour was born a man of the Virgin Mary; and at other times held that he descended in the flesh from heaven, and that his body, being coessential and coeternal with his divinity, ought equally to be worshipped. He published many other absurd and wild doctrines, which his followers improved upon no little, by adding to them a large mixture of the errors of the Manicheans.

APOLLONIA, in antiquity, an annual festival celebrated by the Ægialians, in honour of Apollo.

APOLLONIAN *Hyperbola* and *Parabola*. See the articles HYPERBOLA and PARABOLA.

APOLOGUE, a moral fable, or ingenious kind of fiction, whose end is to mix instruction and entertainment together; of this sort are the fables of Æsop. Some writers have pretended to distinguish between an apologue and a parable; in the former they say only beasts speak, in the latter men; so that the one may be real, the other is necessarily false. But these two words are made use of promiscuously by the best authors.

APOLOGY, a defence or excuse for some person, action, or the like, either by words or writing.

The word is Greek, απολογια, and derived from απολογεομαι, to defend or excuse.

APONEUROSIS, in anatomy, the spreading or expansion of a nerve or tendon, in the manner of a membrane.

The word is Greek, and compounded of απο, from, and νευρον, a nerve.

APONOGETON, in botany, a name given by some to the zannichellia of Linnæus. See ZANNICHELLIA.

APOPHYGE, in architecture, the convex part, or ring, of a column, lying either above or below the flat member. It was originally nothing more than the ferril or ring, fixed on the extremity of a wooden pillar to prevent its splitting; and was afterwards imitated in stone.

The word is Greek, and properly signifies *flight*; and hence some architects call it the spring of the column.

APOPHYSIS, in anatomy, a protuberance of a bone, or a part jutting out beyond the rest.

APOPLECTIC, something that relates, or belongs to, an apoplexy.

APOPLEXY, among physicians, any disorder which instantaneously deprives a man of life, who a few minutes before was, or at least seemed to be, in perfect health; but it is usually confined to sudden disorders caused by affections of the brain.

The word is derived from the Greek, αποπλητω, to ſtrike ſuddenly.

In an apoplexy the patient is ſuddenly deprived of the exerciſe of all the ſenſes, both external and internal, and of voluntary motion, whilſt the pulſe, which is generally ſtrong, remains, together with a laborious and deep reſpiration, attended with a conſiderable elevation of the breaſt, with a ſtertor, and the appearance of profound and perpetual ſleep.

A multitude of the moſt accurate obſervations have made it appear, that this diſorder ariſes from whatever cauſe is capable of preventing, either totally or in part, the influx of the nervous fluid, ſecreted in the cerebrum, to the organs of ſenſe and voluntary motion, and the reflux of the ſame fluid from the abovementioned organs to the common ſenſory in the brain; whilſt the progreſs, and perhaps the return, of the fluid, ſupplied by the cerebellum, to and from the heart, and organs of reſpiration, is preſerved in a degree ſufficient to ſupport, in ſome meaſure, their functions.

All theſe cauſes, as obſerved and delivered by authors, may, for the greater perſpicuity, be reduced to claſſes; in the firſt of which may be reckoned,

1. The natural make of the body: thus, when the head is naturally large, the neck ſhort, and, as it ſometimes happens, conſiſting only of ſix vertebræ, whereas there ought to be ſeven, this ſtructure diſpoſes to an apoplexy, as it favours the congeſtion of blood and humours in the head. Thus alſo, if the body is corpulent and fat, the capillary arteries in general will be ſubject to compreſſion; and, in conſequence thereof, a greater quantity of blood and humours will flow into the veſſels which convey them to the brain. Thus alſo a plethoric habit, and a redundance of pituitous humours in the blood, lay a foundation for the ſtagnation of the juices, and a ſubſequent rupture of the veſſels in the brain.

2. To the ſecond claſs belong all thoſe cauſes which induce ſuch a change in the blood, lymph, and nervous fluid, as to render them incapable of circulating freely through their reſpective veſſels in the brain. Amongſt theſe are,

Polypous concretions in the carotid or vertebral arteries, whether formed originally about the heart, or within the cranium; which are diſcovered by a palpitation of the heart, an unequal pulſe, a vertigo, and temporary loſs of ſight, often recurring, and which are increaſed by motion or heat.

3. To the third claſs belongs whatever compreſſes the arteries themſelves, or the nervous veſſels of the brain, ſo as to prevent a free circulation of their reſpective fluids through them.

People who are plethoric, that is, full of blood, and bloated with bad humours, are much ſubject to this ſpecies of apoplexy; eſpecially if extraordinary motion or heat increaſe the velocity of the circulation. Hence it is apparent that the diſorder muſt be promoted in ſuch conſtitutions by high feeding and ſpirituous liquors; medicines which are acrid, and excite the motion of the blood, ſuch as cardiacs, volatiles, and emetics; by exceſſive heat and motion; and by intenſeneſs of thought, eſpecially if long continued, and frequently repeated, becauſe this determines a more copious flux of humours towards the brain.

4. To the fourth claſs belong all thoſe cauſes, which, by any means, ſo diſſolve the texture of the arteries, veins, or lymphatic ducts, belonging to the internal part of the cerebrum, as to cauſe an extravaſation of their reſpective fluids, which then preſs upon and injure the medullary origin of the nerves of the cerebrum. Such, for example, are an acrimonious ſerum in hydropic and leucophlegmatic caſes; a redundance of blood in a plethora; an atrabiliarious acrimony prevalent in melancholy; ſcorbutic, and arthritic conſtitutions, which frequently produces an apoplexy, and uſually operates betwixt the fortieth and ſixtieth years of life. Now, all theſe may remain latent in the conſtitution for ſome time; but, upon being excited by adequate cauſes, they are frequently productive of a ſudden apoplexy; which may be foreſeen by comparing the materials ſubſiſting in the conſtitution with the cauſes capable of exciting them to action, which are principally violent affections of the mind, and intenſe ſtudies; to which, perhaps, imprudent and exceſſive venery may be added.

5. Some ſorts of poiſons, which are ſuddenly deleterious, may be ranked in the fifth claſs; but theſe may be either reduced to the ſecond, third, or fourth; or may be more properly ſaid to act upon the lungs than the brain. Amongſt theſe are the fumes of mineral ſulphurs, of charcoal, and that gas ſylveſtris, or incoercible ſpirit, which exhales from vegetable juices during fermentation.

The anatomical inſpection of bodies which have died of apoplexies, and the hiſtorical obſervation of ſuch circumſtances as occur in the treatment of ſuch caſes, furniſh us with a knowledge of theſe cauſes; and a due reflection upon theſe naturally leads us to a diſtribution of them into the preceding claſſes, which are admirably adapted to the inveſtigation of the beſt methods of cure.

As to the cure and prevention of an apoplexy, no univerſal rules can be laid down; for as the prediſpoſing and exciting cauſes, together with the parts principally affected, are various, the method of relief muſt alſo vary; and muſt be attempted before the diſorder grows inveterate, otherwiſe it will be difficult to do it with ſucceſs.

If, therefore, an apoplexy, from a glutinous, inert cold cauſe, is foreſeen from the ſigns above ſpecified, the intentions muſt be directed, firſt, to

to avert the preſſure of the glutinous juices from the head.

Secondly, to attenuate the glutinous viſcidity in the brain, and in the whole habit.

The preſſure on the veſſels of the brain are to be diminiſhed,

Firſt, by a derivation of the humours to other, and theſe oppoſite parts.

Secondly, by univerſal evacuations.

A derivation of the humours is effected by vapours, fomentations, and baths, applied to particular parts, by which it is intended the humours ſhould be invited; by ſuction with cupping-glaſſes, by ſinapiſms and veſicatories, among which cantharides are of great importance, as they both invite the humours to the part where they are applied, and attenuate at the ſame time; by cauſtics, iſſues, ſetons, and frictions; by ligatures made upon the large veins of the feet, legs, and thighs. To theſe may be added collutions, gargariſms, and maſticatories, which excite a diſcharge of ſaliva, and apophlegmatiſms applied to the mouth, fauces, and noſe. *Boerhaave.*

APOSIOPESIS, in rhetoric, implies the ſuppreſſing, or omitting to relate part of the ſubject.

The word is Greek, and derived from αποσιωπαω, to keep ſilence.

APOSTACY, the act of abandoning the true religion.

APOSTHUME, in ſurgery, the ſame with abſceſs. See the article ABSCESS.

APOSTIL, a marginal note, or remark in the margin of a work.

APOSTLE, a meſſenger ſent by ſome perſon on a buſineſs of importance; and hence the word is applied by way of eminence to imply one of the twelve diſciples commiſſioned by Chriſt to preach the Goſpel.

The word is formed from the Greek, αποστολος, and derived from αποστελλω, to ſend on a meſſage.

There are various conjectures with regard to the reaſon which induced our Saviour to make choice of twelve apoſtles; but the moſt probable is, that he did it in alluſion to the twelve patriarchs, as the founders of their ſeveral tribes; or to the twelve chief heads or rulers of thoſe tribes, of which the body of the Jewiſh nation conſiſted.

APOSTOLIC, or APOSTOLICAL, ſomething connected with, or derived from, the apoſtles.

APOSTOLICS, a name which two ſects of Chriſtians took upon themſelves formerly, under pretence that they imitated the manners and conduct of the apoſtles. The firſt of the Apoſtolics, otherwiſe called Apotactiques, ſprang up in the third century, and profeſſed abſtinence from marriage, from wine, and from fleſh. The others aroſe in the twelfth century, and likewiſe condemned marriage, but allowed the uſe of concubines: they would not admit of baptiſm, and in many reſpects imitated the errors of the Manicheans.

APOSTROPHE, a figure in rhetoric, when an orator abruptly breaks off his diſcourſe, and addreſſes himſelf immediately to any perſon, quality, or thing, animate or inanimate, as if it was preſent, and was capable of being affected by him. Such, for inſtance, is that paſſage in the fifteenth chapter of the Corinthians, where St. Paul, after he had ſhewn that this corruptible body ſhould put on incorruption, and this mortal be cloathed in immortality, calls out, with an air of triumph, *O Death, where is thy ſting? O Grave, where is thy victory?*

If this figure is introduced with propriety, it has a moſt happy effect; as it takes off the languor of a dull narration, and converts a dry and cold deſcription into life and action. But it ought to be made uſe of very ſparingly; for the thread of an orator's diſcourſe ſhould never be broken off, to turn the eyes of his audience on objects that are either trifling of themſelves, or made ſo by being introduced, when they are foreign to the buſineſs in hand.

The word is compounded of the Greek, απο, from, and στρεφω, to turn.

APOSTROPHE, in grammar, ſignifies a mark placed over a word, to ſhew that there is a letter, or ſyllable wanting, as *mourn'd*, for mourned, and *deûm*, for *deorum*.

APOTACTITES, in eccleſiaſtical hiſtory, the ſame with apoſtolics. See APOSTOLICS.

APOTHECARY, a perſon who practiſes the art of pharmacy.

The word is formed from the Greek, αποθηκη, a ſhop.

This is a very genteel buſineſs, and has been in very great vogue of late years, there being, as has been computed, upwards of 1000 in and about London.

APOTHEOSIS, was a kind of conſecration, or ceremony, made uſe of by the heathens, by which they inſerted any of their emperors, or great men, into the number of the gods.

The word is compounded of the Greek, απο, and θεος, a god.

It is of longer ſtanding amongſt the Romans than ſince the time of Auguſtus, to which its origin has generally been aſcribed: for during the republican ſtate of Rome, there were inſtituted in Greece and Aſia Minor, feaſts and games in honour of the proconſuls ſent from Rome; and prieſts and ſacrifices were appointed, and temples and altars built, where they were worſhipped as divinities. From thence it was adopted, as a moſt ſulſome and impious kind of flattery, to pay court to the emperors. Temples were built to Auguſtus, while

while he was yet alive; and when he was dead, he was solemnly and ceremoniously ranked among their gods; which passed at length into a custom, and was conferred upon all his successors.

As soon as the emperor was dead, the whole city put on mourning; the body was buried in the usual manner, but with amazing pomp and magnificence. In the vestibule of the palace, on a bed of ivory, covered with cloth of gold, was laid a figure of wax; which exactly resembled the deceased, with a pale and languid look, as when he was sick. The senate in mourning weeds were ranged along the left side of the bed, during the greatest part of the day; and on the right, were the matrons, and young ladies of the first quality, dressed in flowing robes of white, without collars or bracelets. This lasted for seven days successively, during which the physicians approached the bed from time to time to visit the patient; and always made their report, with solemn despairing faces, that he grew worse and worse, and there were no hopes. Herodian, from whom this account is taken, does not tell us whether the physicians *prescribed* or not; in all probability they did, as otherwise they could not be entitled to fees.

At the end of seven days this waxen image died; and was carried on the shoulders of the Roman knights, and young senators, along with the bed of state, through the Via Sacra to the Old Forum, where was erected a painted alcove of wood. Upon this alcove were a row of pillars, adorned with ivory and gold, on which they placed the image. The new emperor, the magistrates, and ladies sat down here, while two choirs of music sang the praises of the dead; and after his successor had spoken his eulogium, the body was carried out of the city into the Campus Martius, where a funeral pile was prepared. It was composed of wood in the form of a square pavilion, four or five stories high, decreasing gradually to the top like a pyramid. The inside was filled with combustibles; and the outside adorned with cloth of gold, inlaid with ivory, and rich paintings. Every story composed a portico, supported by columns; and on the top of the edifice was usually placed, in a gilded chariot, an effigy of the deceased emperor. The new emperor, with a torch in his hand, set fire to the pile, and the chief magistrates doing the same on all sides, the flame mounted soon to the summit, from which it affrighted an eagle, or a peacock, that flying in the air carried with it, according to the notions of the people, the soul of the emperor to heaven; from which moment altars were built to him, and he was worshipped as a god.

The apotheosis has been conferred on the favourites of princes, or their mistresses, &c. but in general, this honour was never bestowed in Greece, but at the command of an oracle, nor in Rome, but by a decree of the senate.

It was thus the ancients deified their princes, their heroes, the inventors of arts; and we read in Eusebius, Tertullian, and Chrysostom, that upon the fame of the miracles done by Christ, Tiberius proposed to the senate of Rome, to rank him amongst the gods: but the proposal was rejected, because it was contrary to the laws to introduce into Rome the worship of strange gods: by this name they distinguished the gods of all other nations, except the Greeks, whom alone they did not look upon as barbarous.

The vast number of persons to whom the honours of the apotheosis were paid, rendered the ceremony at last vile and contemptible. In Juvenal, Atlas, fatigued with the weight of so many new gods, groans desperately, and declares that he is ready to sink under the burden of the heavens: and the emperor Vespasian, who was naturally fond of raillery, in the very agonies of death cried out to those around him, "I find that "I am beginning to grow a god every moment."

APOTOME, in geometry, is the difference between two incommensurable quantities or lines; thus the line DE, (Plate X. *fig.* 8.) is the apotome of AC, and CD. Eucl. x. 74.——If we suppose AD equal to a, and AC $= b$ then will their apotome be $a - \sqrt{b}$; or in numbers, $2 - \sqrt{3}$. Hence also the difference between the side BD $= 2$, (Plate X. *fig.* 7.) of an equilateral triangle ABD, and the perpendicular AC $= \sqrt{3}$, is an apotome, viz. $= 2 - \sqrt{3}$; and universally if BD, (*fig.* 9.) be a semi-parabola, whose axis is AB, & *latus rectum* be $= 1$, and if BC be a tangent to the vertex at B, and this be divided into the parts B$a = 2$, B$b = 3$, B$c = 4$, B$d = 5$, &c. and perpendiculars $a1$, $b2$, $c3$, $d4$, these will be from the nature of the curve $\sqrt{2}$, $\sqrt{3}$, $\sqrt{4}$, $\sqrt{5}$, &c. respectively, and therefore half Ba $(= 1) - a1$ will be $1 - \sqrt{2}$; B$a - b2$ will be $2 - \sqrt{3}$; B$b - c3$ will be $3 - \sqrt{4}$; and B$c - d4$ is $4 - \sqrt{5}$; &c. hence by this means we have an infinite series of different apotomes.

Euclid, in 10 lib. and third definition after prop. 85. distinguishes apotomes into first, second, third, fourth, fifth, and sixth; and in the propositions immediately following, shews the method of finding them. The first is when there are two numbers such, that the greatest is a rational one, and the difference between their squares is a square number. A second apotome is when the least number is rational, and the square root of the difference of the squares of the two numbers has a ratio in numbers to the greatest number.

A third apotome is when the two numbers are both irrational, and the square root of the difference of their squares has a ratio in numbers to the greatest number.

A fourth

A fourth apotome is when the greateſt number is rational, and the ſquare root of the difference of the ſquares of the two numbers, has not a ratio to that.

A fifth apotome is when the leaſt number is rational, and the ſquare root of the difference of the ſquares of the two numbers, has not a ratio in numbers to the greateſt number.

A ſixth apotome is when both the numbers are irrational, and the ſquare root of the difference of their ſquares, has not a ratio in numbers to the greateſt number.

The doctrine of apotomes, as laid down by Euclid in his tenth book, is a very curious ſubject, and worthy to be peruſed and improved by all thoſe who would lay down geometrical elements, from whence might be produced the poſſibility or impoſſibility of the quadratures of curve-lineal figures, and perhaps lineal ſolutions of Diophantus's Problems, and others of a ſimilar kind; though all the uſe one would think Euclid made of this book was only to ſhew the nature of the five regular bodies, which by Plato and his ſect were held in great eſteem.

APOTOME, *in the Theory of Muſic*, by ſome writers, is the difference between a greater and leſſer ſemi-tone, being expreſſed by the ratio of 128 to 125.

APOZEM, in pharmacy, the ſame with decoction. See DECOCTION.

APPANAGE. See the article APANAGE.

APPARATOR. See APPARITOR.

APPARATUS, a term uſed to denote a complete ſet of inſtruments, or other utenſils, belonging to any artiſt or machine: thus we ſay a ſurgeon's apparatus, a chemiſt's apparatus; the apparatus of the air-pump, microſcope, &c.

APPARENT, in a general ſenſe, is ſomething that is viſible to the eyes, or obvious to the underſtanding.

APPARENT *Altitude*. See the article ALTITUDE.

APPARENT *Conjunction*, in aſtronomy. See CONJUNCTION *Apparent*.

APPARENT *Diameter*, in aſtronomy, is the angle under which we ſee any of the planets, as thus; Let S repreſent the planet Saturn with his ring, (Plate XI. *fig.* 2.) E, the eye of an obſerver on the earth, from which draw EA, and EB; then the planet Saturn appears under the angle AEB, which angle is called the apparent diameter of Saturn.

There are various ways of meaſuring the apparent diameters of the planets, but the beſt and moſt approved way is by micrometers. See a deſcription of the different micrometers under the article MICROMETER, with the method of uſing them, &c.

The diameter of the ſun, or full moon, may be very accurately meaſured by the altitude of the upper and lower limb, taken with two quadrants by two perſons at the ſame inſtant of time; or by one perſon, with a quadrant fixed in the plane of the meridian, if he is experienced in obſervation, has a good eye, and expert in handling an inſtrument; for the ſun will not ſenſibly vary his altitude on the meridian in the time a good obſerver will take the altitude of both limbs; conſequently the difference of the altitudes is the diameter.

Likewiſe the horizontal diameter of the ſun, moon, &c. may be accurately obſerved by a tranſit inſtrument, and good regulator, by taking the difference of the time of paſſage over the meridian of the firſt and laſt limbs, which difference is the diameter in time when the ſun is in the equator, and may be turned very eaſily into parts of a degree or circle. But if the ſun is in the ſame parallel of the equator, the time muſt be reduced to the equator. For the diameter, &c. of each planet, ſee under the name of each particular planet.

APPARENT *Diſtance*, is that diſtance which we imagine any object to be ſeen afar off from us, which moſtly differs very much from the true; for inſtance, in viewing the heavenly bodies, they apparently ſeem to be at equal diſtances from us, though it is well known they differ many thouſands of miles. Likewiſe, when we view remote objects on the earth, which ſtand ſeparate from other objects, we find that the apparent difference of their apparent diſtance from us ſeldom bears any proportion to the true, it being ſometimes more and ſometimes leſs.

APPARENT *Horizon*. See HORIZON.

APPARENT *Figure*, is that figure, or ſhape, which any object appears under when viewed at a diſtance, which is found generally very different from the true figure. Thus, a ſtraight line at a diſtance may appear a point; the arch of a circle, a ſtraight line; a ſolid, a ſurface; a ſurface, a line; a ſquare, or oblong, a trapezium, or even a triangle; a circle, an ellipſe; a ſphere, a circle; and each will vary according to their different poſitions, directions, or inclinations.

APPARENT *Magnitude of an Object*, is the magnitude it appears to be of to the eye, and is meaſured by the optic angle it appears under. Thus, Let AB, (Plate XI. *fig.* 3.) be an object viewed directly by the eye QR: from each extremity A and B, draw the lines AN and BM interſecting each other in the cryſtalline humour in I; biſect AB in K, and draw IK: then is the angle AIK half the optic angle AIB, which is the meaſure of the apparent magnitude, or length of the object AB.

Diverſe objects, AB, CD, EF, whoſe real magnitudes are very unequal, may be ſituated at ſuch diſtances from the eye, as to have their apparent magnitudes all equal. For if they are ſo

ſituated, that the rays AN, BM, ſhall touch the extremities of each, they will all then appear under the ſame optic angle AIK, which is equal to NIM, which determines the magnitude of the image MN, in the bottom of the eye, the ſame for them all; and therefore they muſt all appear of an equal magnitude.

Objects ſituated at different diſtances, direct to the eye, whoſe apparent magnitudes are equal, are to each other as their diſtances from the eye directly. Let the objects be AB and CD; then becauſe the right-angled triangles CIL and AIK are ſimilar, it will be as IK: IL:: AK: CL; but AK is half AB, CL half CD; therefore it will be, as IK: IL:: AB: CD.

Objects of equal magnitudes, ſituated directly before the eye at unequal diſtances, will appear unequal. For let AB and GH be two objects directly before the eye, at different diſtances, IK, and IS; draw the lines GP and HO croſſing each other in I; then is the optic angle GIH manifeſtly greater than the angle AIB, and the image OP, made by the former, greater than the image MN, made by the latter: therefore the object GH is apparently greater than the object AH, though it is but equal to it.

Equal objects ſituated directly before the eye at unequal diſtances, have their apparent magnitudes reciprocally proportional to their diſtances. For let AB, GH, be two equal objects at unequal diſtances IK, IS, from the eye; produce IG and IH till they interſect AB, each way, produced in T and V. Then will TV be the apparent magnitude of GH, at the diſtance IK: ſince the triangles ISG and IKT are ſimilar, we ſhall have IS: IK:: SG: KT; but SG is equal to AK; therefore it will be IS: IK:: AK: KT.

From what has been ſaid, it appears that there is no ſtandard of the true magnitude of things. All that we can be ſenſible of is, the proportion of magnitude; and yet, notwithſtanding the ſenſible magnitude of things is ever mutable, and varies in proportion to the diſtance, we ſcarcely ever judge any thing to be ſo great or ſmall as it appears to be, or that there is ſo great a diſparity in the viſible magnitude of two equal bodies at different diſtances from us.

Thus, for inſtance, ſuppoſe two men of ſix feet ſtature each, ſtand directly before a perſon, one at the diſtance of one rod, and the other at the diſtance of an hundred. We ſhould, indeed, obſerve a difference in their apparent bigneſs, but ſhould hardly think one appeared an hundred times greater or leſs than the other; or that one appeared ſix feet high, the other not three-fourths of an inch.

But this happens from our prenotions, or judgment that we have beforehand formed of things: we know the proportions of magnitudes in general, and are apt to retain the ideas of things we know to be true; and to prefer them to others, which are preſented by our ſenſes, and exiſt there only, and not in the true relations of things.

APPARENT *Motion*. See MOTION.

APPARENT *Place*, in aſtronomy, is that point on the ſurface of a ſphere, which is determined by a line drawn from the eye to the center of the planet, or other object in the heavens.

APPARENT *Place of any Object*, in optics, is that place wherein it appears, when ſeen through one or more glaſſes. See LENS.

APPARENT *Place of the Image of an Object*, in catoptrics, is that place which the image of an object appears to be in, when made by the reflection of a ſpeculum.

APPARENT *Time*. See TIME.

APPARITION, in a general ſenſe, implies ſimply the appearance of any object.

APPARITION, in aſtronomy, is when the planets, ſtars, or any other heavenly object becomes viſible, which before was below the horizon; thus the heliacal riſing is rather an apparition than a riſing.

Circle of perpetual APPARITION, in aſtronomy, is a great circle of the ſphere, whoſe plane is perpendicular to a line drawn from the center of the ſun to the earth; the enlightened part of the hemiſphere is bounded by this circle in the different points of its orbit. But in geography it is a ſmall circle of the ſphere, deſcribed about the pole as a center, touching the ſouthern part of the horizon in ſouth latitude, and the northern in north latitude. All ſtars in this circle never ſet, but are conſtantly above the horizon; thus the ſtar α, in Lyræ, makes this circle by its diurnal motion to the latitude at Greenwich nearly.

APPARITOR, among the Romans, a general term to comprehend all attendants of judges and magiſtrates appointed to receive and execute their orders. Apparitor, with us, is a meſſenger that ſerves the proceſs of a ſpiritual court, or a beadle in an univerſity, who carries the mace.

APPAUMÉE, in heraldry, denotes one hand extended with the full palm appearing, and the thumb and fingers at full length.

APPEAL, in law, the removal of a cauſe from an inferior to a ſuperior court or judge, when a perſon thinks himſelf aggrieved by the ſentence of the inferior judge. Appeals lie from all the ordinary courts of juſtice to the houſe of lords. In eccleſiaſtical caſes, if an appeal is brought before a biſhop, it may be removed to the archbiſhop; if before an archdeacon, to the court of arches; and thence to the archbiſhop; and from the archbiſhop's court to the king in chancery.

APPEAL, in common law, is taken for the accuſation of a murderer by a perſon who had intereſt in the party killed, or of a felon by an accomplice. It is proſecuted either by writ or by bill: by

by writ, when a writ is purchased out of the chancery by one person against another, commanding him to appeal some third person of felony, and to find pledges for doing it effectually; by bill, when the person himself gives in his accusation in writing, offering to undergo the burden of appealing the person therein named.

APPEARANCE, in a general sense, the exterior surface of a thing, or that which immediately strikes the senses.

Appearance, in law, signifies a defendant's filing a common or special bail, on any process issued out of a court of judicature. In actions by original, appearances are entered with the filazer of the county; and by bill, with the prothonotary.

Appearance, in astronomy, is the same with phenomena and phases, which are more commonly made use of. See Phenomena and Phases.

Direct Appearance, in optics, is when we view any object by direct rays, without refraction or reflection.

Appearance, in perspective, is the projection of any figure on the perspective plane. See Perspective.

APPELLANT, in a general sense, one who appeals. See the article Appeal.

APPELLANTS, signify in church history, those of the Roman catholic clergy who appeal from the bull Unigenitus, given by Clement the XIth. to a general council.

APPELLATIVE, in grammar, is a name that is applicable to any genus, or species, in contradistinction to proper names that belong to individuals: thus, the words horse, tree, ass, &c. are appellatives; Richard, Thomas, Henry, are proper names.

APPELLEE, among lawyers, the person against whom an appeal is brought. See the article Appeal.

APPENDANT, in law, any thing that is inheritable belonging to some more worthy inheritance, as an advowson, common, or court, may be appendant to a manor, land to an office, &c. but land cannot be appendant to land, for both are corporeal inheritances, and one thing corporeal cannot be appendant to another.

APPENDICULAR *Vermiformis*, in anatomy, a name by which some call the cœcum. See the article Cœcum.

APPENDIX, in literature, a treatise added at the end of a work, to render it more complete. See the article Supplement.

Appendix, in anatomy, the same with epiphysis. See Epiphysis.

APPETITE, *Appetitus*, in a general sense, the desire of enjoying some object, supposed to be conducive to our happiness. When this inclination is guided by reason, and proportioned to the intrinsic value of the object, it is called rational appetite; as, on the other hand, it is denominated sensitive appetite, when we have only a blind propensity to a thing, without determinate ideas of the good qualities for which we desire it.

Appetite, in medicine, a certain painful or uneasy sensation, always accompanied with a desire to eat or drink.

An excessive appetite is called by physicians bulimy, or fames canina; a defect or loss of it, anorexy; and that after things improper for food, pica. See the articles Bulimy, Anorexy, &c.

APPLE, a well known fruit of a roundish form, consisting of a rind, or skin, a pulp, or parenchyma, branchery, or seed vessels, and a core. The rind or skin is only a dilatation of the outward rind of the bark of the branch, which produces the fruit; the pulp, although very tender and fine flavoured, is likewise a dilatation or superbience of the inner part of the bark: this is discoverable not only from the visible continuation of the bark from the one, through the stalk to the other, but also from the bladders which both are composed of, and common to each, with this difference, that whereas in the bark the vesiculæ are globular and small, in the pulp they are oblong, and very large, but all uniformly stretched out by the arching of the vessels, from the core towards the circumference of the fruit; the branchery or vessels are only ramifications of the woody part of the branch, sent throughout all the parts of the pulp, the greater branches being made to communicate with each other by inosculations of the less. The main branches are commonly twenty, ten of which are distributed through the parenchyma, most of which direct themselves towards the stool of the flower; the other ten, running in a more direct line, meet at the stool of the former, and are there inosculated with them: to these branches are joined the coats of the kernels. Most of these branches were before extended beyond the fruit, and inserted into the flower for the proper growth thereof; but as the fruit afterward grew larger, and intercepted the aliment before sent to the flower, which being starved, and falling off, the service of the said branches become entirely appropriated to the fruit, fifteen to the pulp, and five to the seed. The apple core is originally from the pith of the branch, the sap of which finding room to diffuse itself in the parenchyma, quits the pith, and hardens into the substance that it appears in.

Amongst all the great variety of fruits growing in England, there is none so universal as the apple, for be the land of a hot and dry, or wet and cold nature, one or other of the sorts (of which there are many) will produce fruit, and where the land is good in its kind, in very great quantities. The excellency of the liquor, called cyder, which

is extracted from this fruit, is a ſufficient encouragement for its propagation, excluſive of its profitable uſes at table, in the kitchen, &c. There are various kinds of apples, ſome of which ripen in the ſummer months, and have their peculiar names to diſtinguiſh them by, as the Margaret apple, the junneting, the codling, the ſummer pearmain, &c. Other ſorts, which are eatable in winter, as the golden pipin, nonpareil, winter pearmain, and divers others, which are of uſe either for the table, paſtry, &c. Alſo ſeveral ſorts which are moſt preferred for making cyder, the chief of which are, the red-ſtreak, Devonſhire wilding, the whitſour, Herefordſhire under leaf, John apple, everlaſting hanger, gennet moyle, and ſeveral others.

Although the trees which produce this fruit are ſo very common in England, it is not a proof that the apple-tree is a native of this iſland; for according to the obſervation of Sir William Temple, it appears that ſoon after the conqueſt of Africa, Greece, Aſia Minor, and Syria, by the Romans, there were brought into Italy divers ſorts of mala, which we call apples, and from thence ſent into other parts of Europe, and propagated as other fruits; the crab-apple, perhaps, may be excepted, though not with any certainty.

All the different ſorts of apples are propagated by grafting, or inoculation, though the latter operation is ſeldom practiſed. The ſtocks which they are grafted on muſt be of the ſame kind, for if they are grafted on the pear or quince ſtock (which, according to the ſyſtem of Linnæus, are of the ſame genera) they will not ſucceed. There are three ſorts of ſtocks uſed in the nurſery gardens, upon which apples are grafted; one ſort called free ſtocks, which are raiſed from the kernels of any kind of apples, which without diſtinction are called crabs; but thoſe that are moſt preferable is from the crab-apple, of which verjuice is made, it being reckoned more hardy, and conſequently better enabled to endure the rigour of very ſevere winters: the ſtock, called the Dutch creeper, is made uſe of in grafting this fruit, to check the luxuriancy of growth, therefore deſigned for ſuch trees that are intended to be planted as dwarfs or eſpaliers: the third ſort is called the paradiſe-ſtock, which is a low ſhrub; if apples are grafted on this ſtock, they will produce fruit the ſecond or third year. It was formerly a practice amongſt gardeners to plant ſmall apple-trees, grafted on paradiſe-ſtocks, in large flower pots or tubs, whereby they produced fruit very plentifully, being kept in ſmall open heads or dwarfs, which were then eſteemed great embelliſhments to the entrances of parterres, cabinets, &c. but in the modern practice of gardening, is now in diſuſe.

All the orchard apples generally agree in the common property of cooling and aſſwaging thirſt, though they ſomewhat differ in degree; as they are more or leſs acid or auſtere. Thoſe are moſt wholeſome which moſt abound with this laſt property, becauſe it maintains the due tenſity of the fibres, and prevents their corrupting with the animal juices. This fruit makes a very good part of our food in ſummer time, when the heat evaporates ſo much of the animal moiſture, as would be inſupportable to the conſtitution, were it not frequently refreſhed with the grateful ſenſations which ſuch coolers produce. For a farther account of propagating the apple, ſee the articles STOCK and GRAFTING.

APPLE-TREE. See MALUS.

APPLES *of Love.* See LYCOPERSICON.

APPLICATE, or APPLICATE *Ordinates*, in geometry, are parallel lines, as *a a*, *b b*, (Plate XL. *fig.* 4.) terminating in a curve, and biſected by a diameter, as AB; the half of theſe, as *a c*, and *b d*, is properly the ſemi-ordinate, though commonly called ordinate. See CURVE, HYPERBOLA, PARABOLA, ELLIPSIS.

APPLICATION, in a general ſenſe, implies the laying two things together, in order to diſcover their agreement.

APPLICATION *of one Science to another*, ſignifies the uſe we make of applying the principles and truths belonging to one ſcience, to complete or advance another.

APPLICATION *of Algebra to Geometry*, implies the ſolving geometrical problems by the aſſiſtance of algebra.

As the line, the ſurface, and the ſolid, objects of geometry are commenſurable magnitudes, it is very natural to think that as algebra and analyſis were wholly employed in the calculation of magnitudes, and diſcovering unknown quantities from proper data, they might be applied with very great advantage to geometry. But however natural and eaſy this application may appear, Des Cartes was the firſt that ever knew it, though algebra had been very greatly improved by ſeveral perſons, eſpecially Vieta.

Des Cartes firſt taught us to expreſs the nature of curves by equations, to reſolve geometrical problems by theſe curves, and, in ſhort, to demonſtrate theorems in geometry by the help of algebraical calculation, when it would be too laborious to demonſtrate them by the common methods. See the articles CURVE and *Conſtruction of* EQUATIONS.

APPLICATION *of Geometry to Algebra.*—The application of geometry to algebra is not ſo common as the application of algebra to geometry, but ſometimes takes place: for as we repreſent geometrical lines by equations, ſo we may repreſent numerical quantities, expreſſed by algebraical ſymbols, by geometrical lines; and by this means ſometimes diſcover a more eaſy method of demonſtration and ſolution.

APPLI-

Application *of Geometry and Algebra to Mechanics.*—This is founded on the ſame principles as the application of algebra to geometry. It conſiſts chiefly in repreſenting the curves which bodies deſcribe in their motion by equations, in determining the equation between the ſpaces which bodies generate, (when acted upon by any powers whatever) and the time they take to paſs through theſe ſpaces, &c. We cannot indeed compare two things of a different nature together, ſuch as ſpace and time; but we may compare the proportion of time with the parts of ſpace paſſed over. Time in its nature flows uniformly, and mechanics imply the ſame uniformity.

Further, without knowing time in itſelf, and having any exact meaſure of it, we cannot repreſent it more clearly, with reſpect to its parts, than by the parts of an infinite right line. Now the proportion between the parts of ſuch a body, moved in whatever manner, may always be expreſſed by an equation. Let us ſuppoſe a curve, the abſciſſæ of which repreſent the portions of time paſt ſince the beginning of the motion, the correſponding ordinates denoting the ſpaces paſſed through during theſe portions of time. The equation of this curve will expreſs, not only the proportion of the time to the ſpace, but, if we may ſpeak ſo, the proportion of the proportion that the parts of time have to their unity, to that which the parts of ſpace paſſed through have to theirs; for the equation of a curve may be conſidered either as expreſſing the proportion of the ordinates to the abſciſſa, or as the equation between the proportion that the ordinates have to their unity, and that which the correſponding abſciſſa have to theirs.

It is evident then, that by the bare application of geometry and calculation, we may account for the general properties of motion, varied by any law whatever, without the help of any other principle. In the article Accelerated *Motion*, may be ſeen an example of geometry applied to mechaniſm; the time of the deſcent of a gravitating body is there repreſented by the perpendicular of a triangle, the velocity by the baſe, and the ſpaces paſſed through by the area of the parts of the triangle

Application *of Geometry and Algebra to Phyſics.* This we owe to Sir Iſaac Newton, as we owe the application of algebra to geometry to Des Cartes, and it is founded on the ſame principles. The properties of bodies in general have between each other certain proportions, which we may compare with each other, more or leſs diſtinguiſhable; and theſe we can diſcover by geometry or algebra. On this are founded all the phyſico-mathematical ſciences. One ſingle obſervation or experiment often demonſtrates a whole ſcience. As for example: The bare knowledge of this, that the angle of incidence is equal to the angle of reflexion, which is known to be true, contains the whole ſcience of catoptrics. This principle of the equality of angles being once admitted, catoptrics becomes a ſcience purely geometrical, becauſe it is reduced to comparing angles with given lines of poſition. The thing is the ſame in many other caſes. By the help of geometry and algebra, we can in general determine the power of one effect, which depends on another better known. This ſcience, therefore, is almoſt always neceſſary to compare and examine the facts experiments diſcover to us. It muſt be owned, however, that every ſubject of phyſics is not equally capable of the application of geometry. Several experiments admit of no calculation at all; ſuch are thoſe of the magnet, electricity, and many others; in theſe caſes we muſt forbear applying to geometry. Many, however, are apt to run into this fault, by advancing hypotheſes on experiments, and proceeding to calculations according to theſe hypotheſes; but theſe calculations ought no farther to be regarded, than as the hypotheſes on which they are ſupported are conformable to nature; and, therefore, obſervations ought to confirm them, which unfortunately ſometimes does not happen. Beſides, ſuppoſing the hypotheſes true, they are not always ſufficient. If there be an effect produced by a great number of circumſtances owing to ſeveral cauſes, which act all together, and we content ourſelves with conſidering ſome of theſe cauſes only, which, being more ſimple, can be calculated more eaſily; we may gain a partial effect of theſe cauſes; but it will be very different from the total effect which would reſult from uniting all the cauſes.

Application *of a geometrical Method in Metaphyſics.*—Geometry has been ſometimes abuſed in phyſics by applying the calculation of the properties of bodies to arbitrary hypotheſes. A geometrical method has alſo been miſapplied in ſciences, which in their own nature ſubmit to no calculation, we mean the method only, not the ſcience. Several metaphyſical writers, who have publiſhed certain truths, have yet, copying after the manner of geometricians, ridiculouſly enough ſwelled their page with the pompous words axiom, theorem, corollary, &c.

The authors of theſe works certainly imagined that theſe words, by ſome ſecret charm, compoſed the eſſence of a demonſtration; and that by writing at the end of a propoſition, that it might be demonſtrated, they ſhould make that demonſtrable which was not really ſo. Geometry does not owe its certainty to this method, but to the evidence and ſimplicity of its object: and though a treatiſe on geometry, when diveſted of its ordinary terms, may be very good; yet a treatiſe on metaphyſics may be often very bad, by the affectation of following

lowing a geometrical method. We ought even to diſtruſt this claſs of writers: for the generality of their pretended demonſtrations are only founded upon an abuſe of words.

Thoſe who have conſidered theſe things, know how common and eaſy the abuſe of words is, eſpecially in metaphyſical ſubjects. It is in this particular the ſchoolmen have excelled; and it is pity they made no better uſe of their ſagacity.

APPLICATION *of Metaphyſics to Geometry.*—Metaphyſics are ſometimes miſapplied in geometry, as well as geometry in metaphyſics proper to itſelf, which is certain and inconteſtable; becauſe the geometrical propoſitions which reſult from it, afford an evidence which demands our aſſent. But as mathematical certainty ariſes from the ſimplicity of its objects, its metaphyſics too muſt be extremely ſimple and clear; muſt always be capable of being reduced to perfect ideas, without any obſcurity. In ſhort, how can the conſequences of any thing be certain and evident, if the principles are not ſo? Yet ſome authors have thought themſelves able to introduce into geometry a kind of metaphyſics, often obſcure; and, what is ſtill worſe, have affected to demonſtrate, metaphyſically, truths which have been already eſtabliſhed on other principles: this ſurely was the way to render thoſe truths doubtful, if they could poſſibly be ſo. The new geometry has principally occaſioned this falſe method. By conſidering parts infinitely ſmall as real quantities, and admitting ſome of theſe to be greater and ſome leſs, they have acknowledged an infinity of ſmall particles of different claſſes; and looked on them as real ſomethings, inſtead of endeavouring to reduce theſe ſuppoſitions and calculations to ſimple ideas.

Another abuſe of metaphyſics in geometry conſiſts in confining metaphyſics to geometrical demonſtrations. Admitting even the metaphyſical principles we ſet out upon to be certain and evident, there are ſcarce any geometrical theorems that can be accurately demonſtrated by their help alone; they almoſt always require lines and calculations: this manner of demonſtration is very material, becauſe it is in ſhort the only ſure and certain method; ſince with our pens, not metaphyſical reaſonings, we can make combinations and certain calculations.

This latter kind of metaphyſics, which we have been ſpeaking of, is however uſeful to a certain degree, provided we do not confine ourſelves too much: it makes us carefully examine the principles of diſcoveries; it furniſhes us with lights; it points out to us the road; but we are not ſure of being right, if we may be allowed the expreſſion, without the ſtaff of calculation to point out the proper objects which we before ſaw confuſedly.

One would think great geometricians ought always to be excellent metaphyſicians; at leaſt in the objects of their ſcience. This is not, however, always the caſe: ſome geometricians are like people who poſſeſs a ſenſe of ſeeing, contrary to that of feeling; this proves yet more how neceſſary calculation is in geometrical truths. One may venture to affirm, that the geometrician who is a bad metaphyſician in the objects he applies himſelf to, will in others be intolerable: though geometry, whoſe object is the menſuration of body and matter, may in ſome caſes be applied to thought.

APPLICATION *of one Thing to another*, is a term made uſe of to denote the ſervice the firſt is of to underſtand or bring the ſecond to perfection. Thus the application of the cycloid to pendulums ſignifies the uſe made of the cycloid to bring pendulums to perfection.

APPOGIATURA, in muſic, implies a ſmall note inſerted by practical muſicians between two others at ſome diſtance.

APPORTIONMENT, in law, the diviſion of a rent into parts, in the ſame manner as the land out of which it iſſues is divided.

APPOSITION, in grammar, is a name given to a particular kind of conſtruction, which is called in Greek ἐπεξήγησις: it conſiſts in putting two, or more ſubſtantives in the ſame caſe, without any copulative to join them. Thus in Virgil,

Formoſum Paſtor Corydon ardebat Alexim,
Delicias *Domini*.

APPOSITION, among naturaliſts, is the ſame with juxta-poſition. See the article JUXTA-POSITION.

APPRAISING, the act of valuing or ſetting a price upon goods.

APPREHENSION, in logic, the firſt or moſt ſimple act of the mind, whereby it perceives or is conſcious of ſome idea. See the article PERCEPTION.

APPREHENSION, in law, implies the ſeizing a criminal in order to bring him to juſtice.

APPRENTICE, a young perſon bound by indenture to ſome tradeſman, in order to be inſtructed in his myſtery or trade.

APPROACH, the acceding or advancing of two objects towards each other.

APPROACHES, in fortification, are trenches thrown up and carried on in a zigzag manner by the beſiegers, in order to get nearer the fortreſs, without being expoſed to the fire of the enemy's cannon; theſe trenches are connected by parallels, or lines of communication.

APPROACHING, in gardening; ſee the article GRAFTING *by Approach*.

APPROPRIATION, the annexing a benefice to the proper and perpetual uſe of a religious houſe, biſhopric, college, &c.

APPROVER, in law, implies a perſon, who, having been concerned in committing a felony, accuſes one or more of his accomplices.

AP-

APPROXIMATION, in arithmetic, and algebra, is the method of approaching nearer and nearer to truth, without being able to gain it exactly. There are several methods of approximation laid down by Dr. Wallis, Halley, Ralphson, Ward, Maclaurin, Simpson, &c. which are all nothing more than a series continually converging or approaching nearer to the quantity sought, according to the nature of the series. See SERIES, &c.

APPUI, in the menage, implies the sense of the action of the bridle in the horseman's hand.

APPULSE, in astronomy, is the approach of a planet to the sun, or any fixt star, and is a step towards a transit, conjunction, occultation, eclipse, &c.

The appulse of the moon to fixt stars, since their places have been accurately settled by observation, and the moon's theory corrected, by that most accurate astronomer Dr. Bradley, whose death can never be too much regretted by the astronomers of this nation, is deemed one of the best methods for determining the longitude at sea. The computation at present is too prolix and difficult for sailors, nay, even for most of our learned and theoretical astronomers to put in practice; and though they may lay down rules, and call them short, yet they have not hitherto been able to persuade the practical navigators that they really are so. However, there is now a scheme before the learned and honourable commissioners of longitude, (given in by Mr. George Witchell) for intirely reducing this laborious and difficult computation; and we are apprehensive that this will be the last improvement of the kind, for this gentleman seldom puts any astronomical problem out of his hands, without giving it the finishing stroke; and if he does succeed, as a few months time will determine, we may reckon the appulse of the moon and fixt stars second to Mr. Harrison's time-keeper, with regard to finding the longitude at sea.

APPURTENANCES, in common law, signify whatever things belong to another thing as principal: as hamlets, fisheries, &c. to a manor; seats in a church to houses, &c.

APRICOT, *Armeniaca Malus*, in botany, a genus of fruit-trees, classed by Linnæus with the prunus, or plum. Although the generative parts of the flowers agree according to his system of botany, yet as there is a very material difference not only in the plant and foliage, but also in the taste and form of the fruit, it may therefore be necessary in this work to mention them distinctly. It is said, the apricot (commonly so called) is a native of Epirus, or Epire, a province of Greece, and from thence called *Malus Epirotica*, from whence the English name apricot may be derived, though, more commonly called by the Romans *Malus Armeniaca*, which implies its being originally brought from Armenia in Asia; however, there can be little doubt but that the Romans first introduced it into Italy, and from thence to other European countries. This tree, in England, grows to a tolerable size, producing roundish acuminated leaves serrated at their edges, and placed alternately on free-growing branches, though on the cursons, or spurs, they grow five or six together in a bunch. The flowers, which are rosaceous, (see the article PRUNUS for their generical characters) appear early in the spring before the leaves, and are succeeded by a well-known fleshy succulent fruit. In England there are seven sorts or varieties cultivated, which are, 1. The masculine apricot, which is soonest ripe, and of a small roundish form. 2. The orange-apricot, which is the next that becomes ripe, the flavour of which is but indifferent. 3. The Algiers apricot ripens next, which is oval-shaped, compressed, and of a straw-colour; this fruit is not much esteemed. 4. The Roman apricot is next in order of ripening, and larger than the Algiers. 5. The Turkey apricot, which is larger than the others, and of a globular form, ripens next, and is much better flavoured than any of those abovementioned. 6. The Breda apricot, supposed to be a native of Africa, is a large roundish fruit, of a deep yellow when ripe, and of an orange-colour; within side the flesh is soft, full of rich juice, and higher flavoured than any of the whole tribe. 7. The Brussels apricot is the last in ripening, it is red on the side next the sun, and of a greenish yellow within side when ripe; the flesh is firm and high-flavoured, but often cracks before it is ripe.—All the sorts of apricots are propagated by inoculation on plum-stocks, and trained in the nurseries either for planting against walls, or for standards; the best soil for these, or any other sort of fruit, is fresh untried earth, from a pasture taken about ten inches deep with the turf, which should be laid to rot and mellow, at least twelve months before it is used. When the former soil of the border is taken away, this fresh earth should supply its place, and if the borders are filled with it two months before the trees are planted, the ground will be better settled, and not so liable to sink after the trees are planted. The ground should be raised four or five inches above the level to allow for settling: the borders being thus prepared, make choice of such trees which are of one year's growth from the budding, and if the soil is dry, the best season to plant them is when the leaves are turned yellow, and ready to fall off in autumn, when they will have time to form fresh roots before winter, and be better enabled to withstand the severity of the weather, as also prepared to shoot more vigorous in the spring; but do not cut off any of the head at that time of planting, unless there be any any strong fore-right shoots which

which will not bend to the wall, and muſt therefore be cut away. If the ſoil is very moiſt, it is better to plant in the ſpring, juſt as the ſap begins to be in motion: the trees being ready prepared for planting, by cutting the extremities of the roots ſmooth, and all ſmall decayed fibres off, mark out the diſtances they are to be planted at, which, in a good ſtrong ſoil, ſhould not be leſs than ſixteen or eighteen feet; make a hole where each tree is to ſtand, place the ſtem about four inches from the wall, inclining the top thereto. After having fixed the tree in the earth, nail the branches to the wall, and pour a pail of water on the root, in order to ſettle the earth more compactly about it; then cover the ſurface of the earth round the roots with dung to keep the froſt out. In this ſtate they may remain till February, when, if the weather be good, the branches ſhould be unnailed, and with a ſharp knife cut down to about four or five eyes above the place of inoculation, ſloping the place of inciſion towards the wall. When the weather becomes hot and dry, it will be neceſſary to water them, obſerving to keep ſome mulch round the roots, which will prevent their drying ſo ſoon as if there were none. As new branches are produced, obſerve to nail them to the wall horizontally, and diſplace ſuch ſhoots that grow in a fore-right direction: this muſt be repeated as often as neceſſary, but by no means ſhould the branches be topped in ſummer.—In autumn, when the leaves are dropping off, it will be neceſſary to ſhorten the branches in proportion to their ſtrength. A vigorous branch may be left eight or nine inches long, but a weak one not above five or ſix. By this means, no part of the wall will be left uncovered with bearing-wood, which muſt be the caſe if the branches are left at their full length at firſt, which is practiſed by ſome gardeners: but the error muſt be expoſed, when it is ſeen, that few more buds than two or three ſhoot from the branches, and theſe are for the moſt part produced from the extreme part of the laſt year's wood, ſo that all the lower part of the ſhoots become naked, and this is the reaſon we ſee ſo many trees which have their bearing-wood ſituated only at the extreme parts of the tree. The ſecond ſummer obſerve as in the firſt, to diſplace all fore-right ſhoots as they are produced, nailing in the others cloſe to the wall horizontally, and never ſhorten any of the ſhoots in ſummer, unleſs to furniſh branches to fill vacant places on the wall. At Michaelmas, ſhorten the ſhoots as before directed. The following year's management is much the ſame as the preceding; obſerving, that apricots produce their fruit not only on free-growing branches, but alſo on curſons, or ſpurs, which are produced from two years wood; theſe ſpurs, therefore, ſhould not be diſplaced.

Apricot trees planted againſt a wall, of a weſt or eaſt aſpect, is beſt, as the ſouth aſpect is rather too hot for them. The weſt aſpect is preferable, for it generally happens, that, at the time of their being in bloom, the blighting eaſterly winds prevail, which frequently cut their bloſſoms off, and greatly damages the tree.

The Bruſſels and Breda apricots are moſt commonly planted for ſtandards, and produce fruit of a much richer flavour than thoſe againſt walls; but the misfortune is, that, by blowing ſo early, the flowers are very apt to be deſtroyed by the inclemency of the weather: therefore, inſtead of training them with ſtems ſix or ſeven feet high, it would be better to have them about half that heighth; or they may be placed as dwarfs in an eſpalier, where, if properly managed, they will produce good fruit; and the trees in eſpalier may be more conveniently covered in the ſpring when the ſeaſon proves bad. For a farther account of the management of theſe trees, ſee the article PRUNING.

APRIL, in chronology, the fourth month of the year, containing thirty days.

The word is formed from the Latin *Aprilis*, which is derived from *aperio*, to open, becauſe the buds begin to open during this month.

A-PRIORI *demonſtration*. See DEMONSTRATION.

APRON, in the marine, a platform or flooring of plank, raiſed at the entrance of a dock, a little higher than the bottom, againſt which the gates are ſhut. See the article DOCK.

APRON, in naval architecture, a piece of curved timber, fixed behind the lower part of the ſtem immediately above the fore-end of the keel; it is commonly formed of two pieces, and is uſed to ſtrengthen the ſcarf or junction of two parts of the ſtem. See SHIP-BUILDING, KEEL, STEM.

APRON, in gunnery, a ſquare plate of lead that covers the touch-hole of a cannon, to keep the charge dry. See CANNON.

APSIS, in aſtronomy, is uſed as well for the higheſt part of the orbit of any planet, or the point where the planet is at the greateſt diſtance from the ſun, as the loweſt part of that orbit, when the planet is the neareſt to the ſun. The line of the apſis, or apſides, is a line drawn from the perhelion to the aphelion, as A P, (plate X. *fig.* 1.)

APSIS, among eccleſiaſtical writers, implies the inner part of the ancient churches, anſwering to what is at preſent called the choir.

APSIS is alſo uſed by ſome writers for the biſhop's ſeat or throne.

APTHANES. See ABTHANES.

APTOTE, ſignifies in grammar, a word that is indeclinable, or has no variation of caſes.

It is derived from the Greek α, *without*, and πτῶσις, *a caſe*.

APUS, in aſtronomy, a conſtellation of the ſouthern hemiſphere, placed between Triangulum Auſtriale, and the Chamelion near the ſouth pole; by ſome it is called the bird of Paradiſe. There

are

are four ſtars of the ſixth, three of the fifth, and four of the fourth magnitude in this conſtellation; but as we have never ſeen theſe ſtars, we ſhall not give their-places.

APYREXY, among phyſicians, implies the intermiſſion of a fever.

The word is Greek, ἀπυρεξία, compounded of ἀ, priv. and πυρ, fire, or heat.

AQUA, water. See the article WATER.

AQUA-FORTIS, a corroſive liquor diſtilled from nitre and vitriol, in the following manner.

Put vitriol into an earthen or iron pot; make a fire under it, and the vitriol will begin to melt and ſmoak; increaſe the fire gradually, and it will thicken and aſſume an aſh-colour. Let it be ſtirred with a twig before it becomes ſolid, till it be perfectly dry; but let it be taken as yet boiling out of the pot; for if it grows cold therein, it will ſtick ſo faſt that you will hardly be able to get it out. Pound to a ſubtile powder three pounds weight of this calcined vitriol, and mix them well with four pounds of nitre well dried, and pulverized very fine. Put theſe together in a cucurbit, or retort, or an iron pot, and place the whole in a furnace.

At firſt, let the fire be made not much greater than is neceſſary to boil water. When the recipient grows warm, continue the ſame degree of fire, till all the phlegm is expelled, which you will know from the diminution of the heat of the recipient: increaſe the fire gradually, till you ſee a few yellow vapours ariſe. Keep up the ſame fire for an hour or two, and make it ſo ſtrong as to warm the veſſels moderately. Continue this for ſome hours, and letting the veſſels cool, pour the liquor, now emitting reddiſh fumes, out of the recipient into a glaſs veſſel, having a glaſs ſtopple: this liquor thus prepared is your aqua-fortis.

You ſhould, for ſecurity's ſake, leave in the cloſure of the recipient and veſſel that contains the matter to be diſtilled, a hole, which may be ſtopped and opened with a wooden peg; for if you happen to exceed the juſt degree of fire, eſpecially in the beginning of the operation, the firſt and more ſubtile ſpirits, which are very elaſtic, come forth; the opening therefore of the hole may give them a paſſage, leſt the veſſels ſhould burſt, which would be very dangerous.

AQUA-MARINA, in natural hiſtory, the name of a precious ſtone of a colour compounded of green and blue, nearly reſembling that of ſea-water, from whence the name.

It ſeems very probable that the ancients knew it under the name of the beryl-ſtone; for Pliny obſerved that the moſt beautiful beryls were thoſe that imitated the colour of ſea-water; he likewiſe diſtinguiſhes ſeveral ſorts of beryls, which bear no reſemblance with our aqua-marina; as the chryſoberyls, which were of a golden colour. Whatever the ancients called the aqua-marina, we are now to endeavour to find out a ſure means to diſtinguiſh this precious ſtone from all others. The colour being a mixture of green and blue, we cannot confound it either with green or blue ſtones, as the emeralds and the ſaphires: for if we ſuppoſe the emerald of a pure green, without any tincture of blue, and the ſaphire blue as indigo, and free from any tincture of green, we may eaſily diſcover that all ſtones compounded of green and blue can neither be emeralds nor ſaphires. This mixture of an emerald-colour with that of a ſaphire, that is, of green and blue, deſcribes ſo well the aqua-marina, that it ſeems impoſſible to be miſtaken: not but that there are ſome of theſe ſtones, where the green is more predominant than the blue; as well as others, where the blue is more powerful than the green. Theſe ſtones are very different from each other, with reſpect to their hardneſs. The oriental are reckoned the hardeſt, and bear the fineſt poliſh; and conſequently are more beautiful, more ſcarce, and dearer than the occidental.

The moſt beautiful aqua-marinas come from the Eaſt-Indies; and it is ſaid that ſome of them are found on the borders of the Euphrates, and at the foot of Mount Taurus. The occidental ones come from Bohemia, Germany, Sicily, the Iſle of Elba, &c. And it has been affirmed that ſome of them have been found on the ſea-ſhore.

AQUA-REGIA, a corroſive menſtruum that has the power of diſſolving gold. It is made in the following manner:

Take one pound of common ſalt; melt it in a clean crucible or iron ladle; pour it out into an iron mortar, and when cold break it into ſmall pieces. Put theſe into a retort, and pour upon them twice their weight of good aqua-fortis. Place the retort in a ſand furnace: lute on a receiver, and apply a gradual fire, till no more liquor drops from the noſe of the retort. An aqua-regia may alſo be made, by mixing one part of ſpirit of ſalt with three of aqua-fortis, or by diſſolving the ſame quantity of ſal ammoniac in it: but this ſhould be done ſlowly, and by degrees, otherwiſe great quantities of offenſive fumes will ariſe.

This menſtruum diſſolves iron, copper, tin, gold, mercury, regulus of antimony, biſmuth, and zinc; but not ſilver, unleſs it be deficient in ſtrength.

AQUÆDUCT, in architecture and hydraulics, is a conduit of water, and ſignifies an artificial canal, either under ground or raiſed above it, ſerving to convey water from one place to another according to their level, notwithſtanding the unevenneſs of the intermediate ground. Thus, the water is carried by conduits, pipes, or aquæducts, from the New River head at Iſlington to any part of the city of London that has the ſame height or level with the river's head. The Romans built ſeveral very conſiderable ones in their city; and Julius Frontinus,

nus, who had the direction of them, tells us of nine which discharged themselves through 1314 pipes of an inch diameter: and Blasius upon Livy observes, that these aqueducts brought into Rome above 500,000 hogsheads of water in the space of 24 hours.

AQUÆDUCT, in anatomy, a term applied by anatomists to certain canals, on account of their form or use: such are the aquæduct of Fallopium, a canal situated between the apophyses, styloides, and mastoides; the aquæduct of Nuck, in the sclerotic coat of the eye; and the aquæduct of Sylvius, in the brain, the posterior surface of which is called its anus.

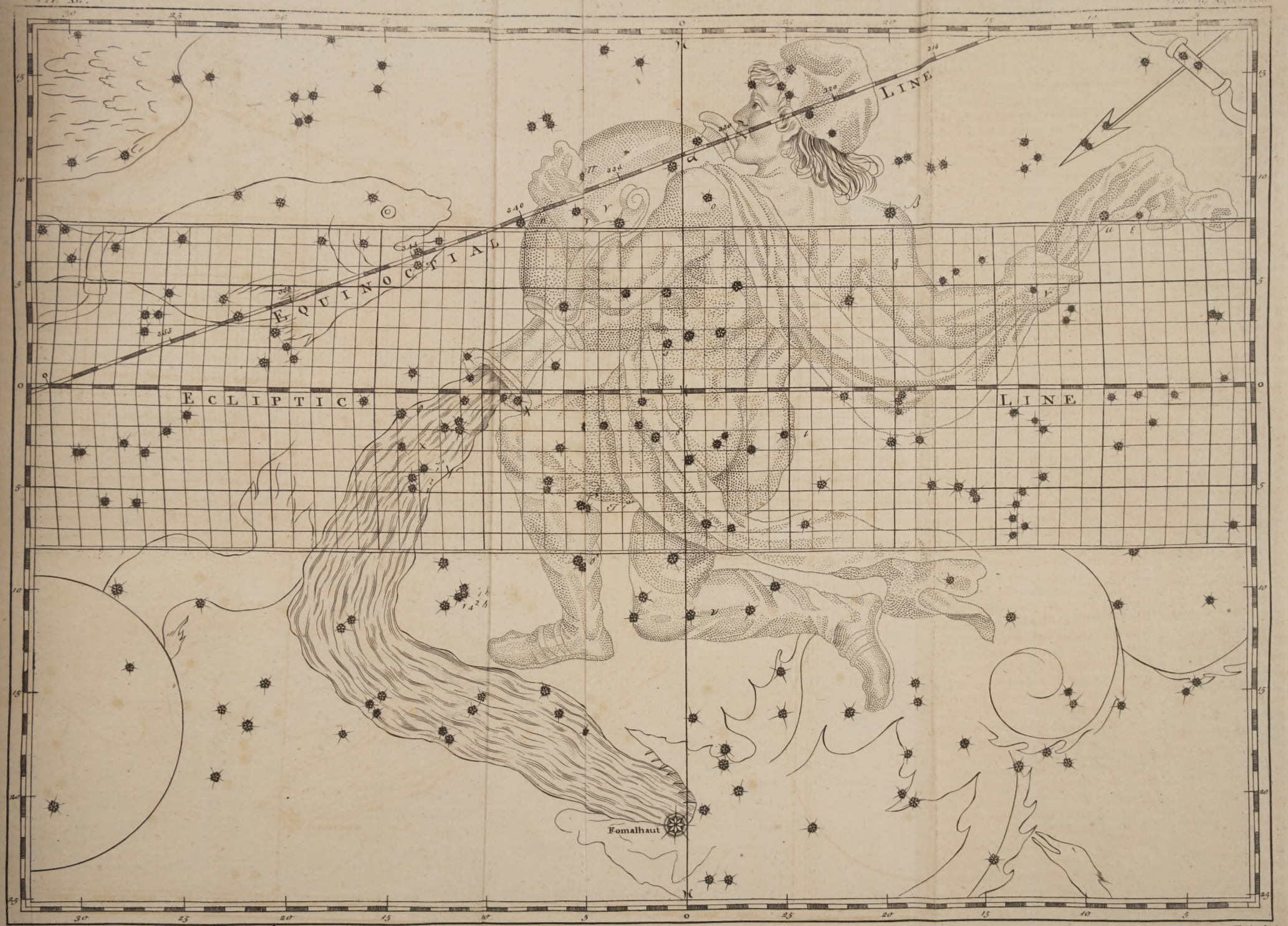
AQUARIANS, a name given to a sect of Christians, who appeared in the third century: they were so called because they substituted water instead of wine when they administered the sacrament.

In the earliest ages of Christianity, when *the people so furiously raged together* against the proselytes to this religion, its votaries were obliged to assemble by night to celebrate their holy mysteries; in which case they made use of water instead of wine, that in the morning the smell might not betray them.

Others mixed water with their wine; because water represents the people, as wine does the blood of Christ: and when both are mixed together, then Christ and his people are united. This practice was confirmed by the council of Carthage: for which two reasons are assigned; first, because it is according to the example of Christ; and, secondly, because when our Saviour's side was pierced with the spear, "straightway came there out blood and wa-" ter." A better reason than either of these might be assigned for the use of water with wine in the eucharist; and that is, that people might not drink inordinately, so as to abuse themselves, which they were wont to do, even in the apostles times: for St. Paul reproves them for it, and asks them, Whether they have not homes to drink in, that they should so abuse that holy festival?

AQUARIUS, in astronomy, a constellation, which makes the eleventh sign of the zodiac; represented by a man (Plate XII.) with a water-pot on his arm inverted, and the water pouring down; signifying that when the sun enters this sign, which is about the 20th of January, we may expect much rain. Poets tell us this Aquarius, when on earth, was the beautiful youth Ganymede, son of Tros and Callirhoe, whom an eagle sent by Jupiter snatched off mount Ida as he was hunting, and carried him into heaven, where Jupiter made him his cup-bearer, and on whom he attends at all banquets with flowing cups of nectar. Others notwithstanding think it to be Deucalion, the son of Prometheus, whom the gods translated to heaven, in remembrance of that mighty deluge which happened in his time, whereby mankind was almost intirely swept from the earth. The following is a catalogue of stars in this constellation, settled to 1770.

Order.	Magnit.	Name.	Byer's Le.	Right Ascension	Distance from Nor. Pole.	Var. in Right Ascen.	Var. in Declination.
				° ′ ″	° ′ ″	″	″
1	6			306.46.45	90.20.47	46.10	12.50
2	4		ε	308.48.11½	100.19.23	49. 5	12.53
3	5			308.45.54	95.53.42	48.15	12.54
4	6			309.40.20	96.34.52	48.15	12.61
5	6			309.50.48	96.23.54	48.15	12.72
6	5		μ	310. 3.28	99.49.54	48.52	12.87
7	6			310.58.13	100.36.12	48.52	12.99
8	7			311.40.48	103.58.29	44.40	13.20
9	6			311.58.10	104.27.16	50.10	13.42
10	6			311.57. 1	96.24.14	48.15	13.51
11	6			311.56. 5	95.38. 8	48.10	13.63
12	6			312.50 29	96.45.25	48.15	13.75
13	5		ν	314.15.41	102.17.49	49.18	13.94
14	6			315.51. 6	100.12. 1	48.30	14.20
15	6			316.23.29	95.34.39	47.40	14.31
16	6			317. 7.17	95.34.28	47.40	14.45
17	6			317.30.19	100.19.30	48.40	14.57
18	6			317.45.50	103.53.37	49.33	14.69
19	6			318. 4.19	101.45.16	48.35	14.80
20	6			318. 4.50	94.24.56	46.58	14.95
21	6			317.10.52	94.34.34	46.58	15.11
22	3		β	319.51.30	96.34.18	47.42	15.31
23	6		ξ	321.22.25	98.51. 7	48.15	15.41
24	6			321.49. 8	91. 7.11	47.42	15.53
25	6		d	321.51. 1	88.49.53	47.42	15.59
26	6			322.29.16	89.48.26	46.42	15.62
27	6			323.45.52	88.25.14	46.10	15 73
28	6			326.12. 4	90.32. 7	46.30	15.89
29	6			327.19.55	108. 7. 1	49.40	16.01
30	6			327.42.12	97.40.48	47.43	16.43
31	5		o	327.51.11	93.15.24	46.48	16.96
32	6			328. 6.53	99. 3.46	46.27	17.00
33	4		i	328.29.57	104.58.33	49. 0	17.07
34	3		α	328.29.27	91.25.42	46.27	17.07
35	5			328.57.27	109.41. 8	49.53	17.18
36	6			329.10.45	99.21.56	47.45	17.21
37	6			329.25.48	101.59.30	47.32	17.21
38	6		e	329.27. 4	102.44.12	48.29	17.27
39	6			329.52.34	105.22.22	49.05	17.30
40	8			330. 9.21	103. 4.54	49.18	17.41
41	6			329.14.42	112.15.56	49.55	17.45
42	7			330.59. 7	104. 1.19	48 37	17.54
43	4		θ	331.10.17	99. 1. 0	47.43	17.54
44	6			331.10.17	96.34.35	47.38	17.59
45	6			331.31.34	104.28.55	48.29	17.61
46	6		g	332. 1.17	98.58.13	47.41	17.69
47	6			332. 5.21	113.47.45	49.55	17.71
48	3		γ	332.26.35	92.32.21	46.36	17.76
49	5			332.30.54	116.57.29	49.58	17.79
50	6			332.53.30	104.43.29	48.35	17.85
51	6			332.53.55	96. 2.44	46.58	17.88
52	5		π	333.22.57	89.46.56	46.10	17.91
53	6			333.22.58	107.56.19	49.10	17.92
54	6			333.39.43	102.25.23	48. 9	17.94



Aquarius

Hodge Sculp.

Order.	Magnit.	Name.	Bayer Let.	Right Aſcenſion	Diſtance from Nor. Pole.	Var. in Right Aſcen.	Var. in Decli-nation.
				° ′ ″	° ′ ″	″	″
55	4		ζ	334.14.45	91.11.24	46.22	18.04
56	6			334.21.44	101.48.27	49. 0	18.06
57	5		σ	334.34.55	101.50.51	48. 0	18.09
58	6			334.44.14	102. 7.36	47.40	18.15
59	5		υ	335.31.13	111.12.40	49.33	18.23
60	6			335.35.10	92.48.34	46.25	18.25
61	6			335.44.38	108.51.26	49.12	18.25
62	4		y	335.52.18	91.17.42	46.23	18.28
63	5		K	336.27.37	95.24.26	46.57	18.37
64	6			336.35.16	101.16. 6	47.45	18.39
65	6			337.36.49	101.20.57	47.43	18.41
66	6	1ma ad	g	337.40.13	110. 4.42	49. 5	18.46
67	6			337.40.19	98.12.25	46.50	18.50
68	6	2da ad	g	338.40.20	110.51.18	49. 8	18.61
69	5	1ma ad	T	338.52.17	105.15.47	48. 2	18.68
70	6			339.18.17	101.49.25	48. 4	18.75
71	5	2da ad	T	339.20.59	104.48. 1	48. 4	18.76
72	6			339.33.41	95.34. 8	46.50	18.79
73	4		λ	340. 9.10	98.48. 0	47.15	18.84
74	6			340.12.25	102.53.13	47.15	18.85
75	7			340.21.35	103.26.36	47.42	18.87
76	3	Sheat	ſ	340.36.26	107. 2.18	48.15	18.90
77	6			340.37.58	107.32. 0	47.42	18.95
78	6			340.38.46	98.28.40	46.50	18.96
79	1	Fomalht.		341.13.25	120.50. 5	50.06	18.97
80	7			341.32. 1	96. 0.39	46.48	18.99
81	7			342.13.14	98.20. 4	46.50	19.10
82	7			342.31.37	97.50.58	46.50	19.17
83	6	1ma ad	b	343.17.21	98.55.48	47. 1	19.20
84	7	2da ad	b	343.19.57	98.58.28	47. 1	19.20
85	6	3tia ad	b	343.28.23	99.10.24	47. 8	19.20
86	6	1ma ad	c	343.28.29	115. 2.33	49. 5	19.23
87	6	4ta ad	b	343.45.20	99.57.43	47. 0	19.25
88	4	Borl. ad	c	344. 9.40	112.28.42	48.27	19.29
89	5	Auſt. ad	c	344.16.15	113.45.32	49. 7	19.34
90	5		φ	345.36. 6	97.17. 4	46.50	19.41
91	5	1ma ad	Ψ	345.57.26	100.20.13	47. 5	19.44
92	6		x	346.13.51	99.58.36	46.57	19.47
93	5	2da ad	Ψ	346.29. 8	100.23. 4	47. 4	19.49
94	6		Ψ	346.43.59	100.51.52	47. 5	19.51
95	5	3tia ad		346.37.11	101.55. 9	46.50	19.51
96	7			346.51.58	96.22.41	46.52	19.52
97	6			347.21.32	106.22.23	47.40	19.54
98	5	1ma ad	b	347.35.53	111.24.14	47.40	19.59
99	5	2da ad	b	348.21.52	112.57.41	47.49	19.65
100	5	3tia ad	b	349.46.12	112.41.13	47.43	19.70
101	5	4ta ad	b	350.10.57	112.14. 9	47.43	10.75
102	5	1ma ad	w	351.50.32	105.33. 7	46.50	19.79
103	5	1ma ad	A	352.17.31	109.20.53	47.40	19.79
104	5	2da ad	A	352.18.41	109.25.58	47.40	19.81
105	5	2da ad	w	352.34.48	105.51.40	46.48	19.87
106	5	3tia ad	A	352.57. 7	109.36.38	46.50	19.89
107	6	4ta ad	A	353.23.30	110. 0.42	46.50	19.94
108	6	5ta ad	A	354.45.16	110.14.41	46.48	19.98

AQUATIC, in natural hiſtory, is an appellation given to ſuch things as live or grow in the water.

AQUEDUCT, the ſame with aquæduct. See AQUÆDUCT.

AQUEOUS, ſomething abounding with water, or that partakes of its nature.

The word is formed from the Latin, *aqueſus*, which is derived from *aqua*, water.

AQUEOUS *Humour*, in anatomy, called alſo the albugineous humour, is the utmoſt of the three humours of the eye, and fills up both its camæra. In this the uvea fluctuates as it were, and moves at liberty: this humour alſo, when loſt, will be repaired by nature.

AQUIFOLIUM, or AGRIFOLIUM. See ILEX.

AQUILA, the eagle, in natural hiſtory. See the article EAGLE.

AQUILA, in aſtronomy, a conſtellation of the northern hemiſphere, repreſented by an eagle. The poetical reaſon of the eagle having a place in the heavens is this; Jupiter transforming himſelf into the form of an eagle, took Ganymede (whom he greatly loved) into heaven; and therefore, becauſe by means of the eagle he executed his purpoſe, placed the figure among the conſtellations in remembrance of the action. Others ſay, that Jupiter was brought up in a cave in Crete by doves, who fed him with ambroſia; and an eagle with nectar, which he drew from a rock, and carried in his bill: for this he was honoured with celeſtial dignity. Others ſay, that in the wars of the giants the eagle brought thunder to Jupiter, with which he quelled them, and is therefore called Jove's armour-bearer. The following are the ſtars in this conſtellation, together with Antinous, according to the order of the Britiſh Catalogue, ſettled to the year 1770.

Order.	Magn.	Name.	Bayer Let.	Right Aſcenſion	Diſtance from No. Pole.	Var. in Right Aſcen.	Var. in Decli-nation
				° ′ ″	° ′ ″	″	″
1	4		m	275.31.19	98.23.44	49.02	1.56
2	5		o	277.17. 1	99.15.38	49.22	2.03
3	5		n	277.36.32	98.30. 8	49.22	2.07
4	5			278.10.33	88.10.32	46.00	2. 5
5	6			278.32.26	91.12.22	47.90	3.01
6	4		l	278.37.37	95.59.31	47.90	3.26
7	6			279.37.38	93.31.34	46.82	3.30
8	6			279.40.59	93.35.11	46.82	3.38
9	4		k	281. 2. 0	96. 8.45	48.50	3.39
10	6			281.56.23	76.24.36	41.49	3 40
11	6			282. 0.58	76.41.19	41.49	3.42
12	4		i	282.12.46	96. 3.48	48.50	3.44
13	4		e	282.10.47	75.14.42	41.01	4.23
14	6		g	282.34.50	94. 1.43	49.90	4.27
15	6		h	282.64.58	94.22.19	49.90	4.49
16	3		λ	283.23.40	95.10.36	47.92	4.64
17	3		ζ	283.28.55	76.28.00	41.49	4.85

Order.	Magn.	Name.	Bayer Let.	Right Aſcenſion	Diſtance from No. Pole.	Var. in Right Aſcen.	Var. in Decli-nation.
				° ′ ″	° ′ ″	′	′
18	6			283.54.42	79.17.05	42.90	4.95
19	6			284.17.52	84.17.12	44.30	4.98
20	6			284.54.39	98.19.43	48.75	5. 0
21	5			285.23.54	88. 5.35	46. 0	5.22
22	6			286. 8.46	85.34.27	44.33	5.30
23	7			286.34.52	89.21.23	46.03	5.38
24	7			286.38.11	90. 5.10	46.03	5.47
25	6	1ma ad	ω	286.38.39	78.49.31	46.03	5.56
26	6		f	286.55.25	95.51.22	47.91	5.79
27	6		d	287. 3.26	91.19.46	46.72	5.90
28	6		A	287. 6. 9	78. 3.22	41.51	6.10
29	7	2da ad	w	288.10. 0	87.21.25	43.54	6.23
30	3		β	288.13.23	87.19.41	45.30	6.31
31	6		b	288.23.11	78.34.12	41.48	6.40
32	5		v	288.33.26	90. 6.44	46.13	6.48
33	6			288.54.50	94.13.17	47.90	6.57
34	6			289.11.52	93.45.41	47.87	6.70
35	6		c	289.12.58	88.31.22	46. 0	6.82
36	6		e	289.31.27	93.16.33	46.74	6.90
37	6		k	290.28.13	101. 4.13	49.22	6.97
38	4		μ	290.34.40	83. 7. 0	43.91	7.05
39	4		κ	290.58.46	97.32.51	48.70	7.18
40	6			291. 0.15	93.27.41	47.85	7.20
41	4		i	291. 4.19	91.48.18	46.72	7.21
42	6			291. 9.43	95. 9.59	48.68	7.33
43	6			291.26.37	92. 0.23	46.64	7.45
44	5		σ	291.49.33	85. 8.14	44.33	7.56
45	6			292. 5.21	91.10.16	46.72	7.68
46	6			292.44.20	78.21.15	42.90	7.79
47	6		χ	292.48.46	78.44.33	42.90	7.87
48	6		Ψ	293.20.40	77.15.30	42.90	7.94
49	6		v	293.29.36	82.57.48	45.34	8. 0
50	3		γ	293.34.38	79.55.56	42.93	8.07
51	5			294.20.28	101.21.48	49.50	8.20
52	6		π	294.20.29	78.46. 8	42.90	8.31
53	2.1	Lucida	α	294.38.47	81.43.41	43.55	8.40
54	5		o	294.51.56	80.10.13	42.92	8.45
55	4		n	295. 4.32	89.35. 4	46.03	8.50
56	6			295.16. 7	99.11.10	49.07	8.55
57	6			295.24.15	98.50.26	49.07	8.61
58	6			295.35.58	90.20.31	46.03	8.66
59	5		ξ	295.38.21	82. 8.38	43.55	8.70
60	4		β	295.45.20	84. 9.11	44.33	8.76
61	6		φ	296.12.11	79.12.12	42.92	8.80
62	6			297.59.47	91.22. 5	46.17	8.85
63	6		T	298. 5.34	83.23.35	43.90	8.89
64	6			298.54. 3	91.19.40	46.17	8.92
65	3		θ	299.36. 0	91.29.18	46.64	9.95
66	6			300.12.19	91.43. 8	46.70	10.00
67	5			300.47.13	75.31.49	41.49	10.07
68	6			303.57.14	94. 8.40	47.90	10.13
69	5			304.16.20	93.40.40	47.90	10.18
70	5			306. 2.45	93.22.47	47.90	10.25
71	4			306.29.22	91.56.32	46.72	10.30

AQUILA *Marina*, the ſea-eagle, the name of a fiſh of the paſtinacha kind, with a head reſembling in ſome meaſure that of a toad.

AQUILEGIA, *Columbine*, in botany, a genus of polyandrious plants, the flowers of which are pendulous and deſtitute of an empalement, but conſiſt of five plain lanceolated petals expanded. Within the flower are five nectariums ranged alternately with the petals, each of the horns widening upward, the opening being oblique to the ſide as it aſcends, and is annexed to the receptacle, with the lower part lengthening gradually into a long tube hanging by an obtuſe apex: the filaments are numerous, topped with oblong erect antheræ. It hath five oval germen, ſupporting five awl-ſhaped ſtyles, which are longer than the ſtamina, and crowned with ſingle upright ſtigma: each germen afterwards becomes a membraneous capſule, which is upright and cylindrical, containing many oval ſhining ſeeds. The columbine makes an agreeable appearance in gardens, producing flowers of various colours, which blow in May or June: they are propagated either by ſowing the ſeeds or parting the roots, the proper ſeaſon for which is in autumn. The officinal ſort is the ſimple or wild columbine: the leaves, flowers, or ſeeds may be uſed. It moderately warms, dries, and opens; whence it obtains a place in preſcriptions againſt the jaundice, and ſuch-like ill habits, ariſing from obſtructions. It was formerly much eſteemed for throwing out the ſmall-pox and meaſles: a water was diſtilled from it, and a conſerve made of its flowers; but in the preſent medical practice it is much diſuſed.

AQUILICIA, or AQUILICIANA, in antiquity, ſacrifices performed by the ancient Romans, in times of exceſſive drought, to obtain rain from the gods.

AQUOSE, the ſame with aqueous. See AQUEOUS.

ARA, or ALTAR, in aſtronomy, a conſtellation of the ſouthern hemiſphere, containing eight ſtars. The poets gave the following account of the altar's being placed in heaven as a conſtellation. When the giants, called the Titans, were at war with Jupiter, and uſed their utmoſt efforts to pull him out of heaven, the gods thought it neceſſary to meet together, to conſult what was beſt to be done to keep thoſe Titans out of heaven. Their concluſion was, that they ſhould all join together to fight their enemies; and to ratify this their league, they cauſed the Cyclops to make them an altar. About this altar all the gods aſſembled, and ſwore, that with one conſent they would withſtand their enemies. Afterwards having got the victory, it pleaſed them to place the altar in heaven, as a memorial of their league, and a token of the great benefits that ariſe from unanimity and concord. The ſtars in this conſtellation

not

not being visible to us, we shall omit giving their places.

ARABESQUE, or ARABESK, something done after the manner of the Arabians.

ARABIAN, something that relates to Arabia, or the Arabs.

ARABIAN, or ARABIC *Tongue*, is a branch or dialect of the Hebrew.

Father Angelo de St. Joseph speaks much of the beauty and copiousness of the Arabic: he assures us it has no less than a thousand names for a sword, five hundred for a lion, two hundred for a serpent, and eighty for honey.

ARABIAN *Figures* or *Characters*, the numeral figures commonly used in arithmetical computations.

The origin of these characters has been a subject of dispute in the republic of letters. The learned are generally of opinion that the Arabic figures were first taught us by the Saracens, who borrowed them from the Indians. Scaliger was so satisfied of their novelty, that he immediately pronounced a silver medallion he was consulted about modern, upon his seeing of the numeral figures 234, 235, on it. The common opinion is, that Planudes, who lived towards the close of the thirteenth century, was the first Christian who made use of them. Father Mabillon even assures us, in his work de Re Diplomatica, that he has not found them any where earlier than the fourteenth.

Yet Dr. Wallis insists on their being of a much older standing; and concludes they must have been used in England at least as long ago as the time of Hermannus Contractus, who lived about the year 1050; if not in ordinary affairs, yet at least in mathematical ones, and particularly astronomical tables. *Vid Wall. Algeb.*

The same author gives us an instance of their antiquity in England, from a mantle-tree of a chimney in the parsonage-house of Helendon in Northamptonshire, wherein is the following inscription in basso relievo, M°. 133, being the date of the year 1133. *Philos. Transact.* N°. 255.

Mr. Luffkin furnishes a yet earlier instance of their use, in the window of a house, part of which is a Roman wall, near the market-place in Colchester; where between two carved lions stands an escutcheon containing the figures 1090. *Philos. Transact.* N°. 255.

Mr. Huet is even of opinion, that these characters were not borrowed from the Arabs, but from the Greeks; and that they were originally no other than the Greek letters, which we all know that people made use of to express their numbers by.

ARABIAN *Philosophy*, the state of philosophy among the ancient Arabians.

Authors of great antiquity inform us, that the ancient Arabians applied themselves very much to philosophy, and distinguished themselves by a peculiar and superior sagacity; but all they say on this head seems very uncertain. Indeed, after Issamim, learning and the study of philosophy were greatly esteemed among this people; but this has no place in history till we come to the philosophy of the middle age; and consequently proves nothing with regard to the philosophy of the ancient inhabitants of Arabia Felix.

Some men of letters have asserted, that the ancient Arabs applied themselves to philosophical speculations; and to maintain their opinion, raise imaginary systems, which they attribute to them, and draw in the religion of the Sabæans to their aid, which they pretend to have been the offspring of philosophy. But all they advance in favour of this opinion is founded on assertions and conjectures: and what are those where proof and testimony are wanting? They are even forced to acknowledge that the Greeks were of another opinion, looking on them as a most barbarous and ignorant people, without the least tincture of learning. If credit may be given to Abulfaragius, the Arabian writers themselves confess, that before Issamim they were sunk in the deepest ignorance.

These reasons, however, do not seem strong enough to those on the other side of the question to induce them to retract their opinion of the philosophy they attribute to the ancient Arabs. The contempt the Greeks express for this nation, say they, proves only the pride of the Greeks, not the barbarism of the Arabians. But what authority can they produce, or what writers can they quote, in favour of their opinion concerning the philosophy of the ancient Arabians? They agree with Abulfaragius that there are none: this opinion, therefore, stands on a very weak foundation.

Joseph Peter Ludewig has signalized himself most in this dispute, and seems to have had the honour of the ancient Arabians very much at heart. He sets out in this manner: "Pythagoras (says he) as "Porphyry relates, in his travels to improve his "learning, did the Arabians the honour of a visit; "staid some time among them, and learned of "their philosophers divination by the chirping and "flight of birds; an art in which they excelled. "Moses himself, instructed in all the learning of "the Egyptians, chose Arabia for a retreat in his "exile, preferable to other countries. Can one "imagine the great legislator of the Hebrews would "have chose this retreat if the people had been "barbarous, stupid, and ignorant? Besides, their "origin leaves no room to doubt of the improve-"ment of their mind: they boast of their lineage "from Abraham, whom no one can deny to have "been a great philosopher. By what strange ac-"cident is that spark of philosophic spirit extin-"guished, which they inherited from their common "father Abraham? But what yet appears a

" ſtronger argument is this, that the ſacred writ-
" ings, to give a more exalted idea of Solomon's
" wiſdom, place it in oppoſition to the wiſdom of
" the wiſe men of the Eaſt, which is certainly
" Arabia. From Arabia alſo came the queen of
" Sheba to admire the wiſdom of the philoſopher
" inveſted with a diadem; this has been the con-
" ſtant opinion of all men of erudition. It is
" eaſy to prove that the Magi, who came out of
" the Eaſt to worſhip our Saviour, were Arabians.
" In ſhort, Abulfaragius is obliged to agree, that
" before the time of Iſſamim, to whom the revival
" of learning in that country is owing, they were
" perfect maſters of their own language, good
" poets, excellent orators, and able aſtronomers. Is
" not this enough to give them a right to the title of
" philoſophers?"

No, it may be replied, the Arabians might have poliſhed their language, have ſucceeded in compoſition, have been ſkilful in the ſolution of riddles, and interpretation of dreams; nay, though it be admitted they had ſome knowledge of the courſes of the ſtars, it will not follow they were philoſophers; for all thoſe arts, if they merit the name, tend more to increaſe and encourage ſuperſtition, than to diſcover truth, or diveſt the ſoul of the paſſions which enſlave it. As to what concerns Pythagoras, nothing is more uncertain than whether he travelled into the Eaſt or no: but admitting he did, what are we to conclude, but that he learned from the Arabians all thoſe ſuperſtitious and extravagant notions he was ſo extremely fond of? It is needleſs to quote Moſes here; if this great man went into that country, and ſettled there, by marrying one of Jethro's daughters, it certainly was not with a deſign of ſtudying and encouraging them in their fooliſh curioſity in philoſophical ſyſtems. Providence permitted this retreat of Moſes among the Arabians, to carry among them the knowledge of the true God, and his religion. The philoſophy of Abraham, from whom they boaſt their deſcent, by no means proves their having cultivated this ſcience. Abraham might have been their progenitor, and a great philoſopher; but their philoſophy is no neceſſary conſequence of this. If they loſt the thread of thoſe moſt valuable truths they had learned from Abraham; if their religion degenerated into groſs idolatry; why might not their philoſophy, admitting Abraham to have taught it them, have been loſt alſo in courſe of time? Beſides, it is not certain that theſe people deſcended from Abraham. This is a traditionary tale, that ſeems to have taken birth with Mahometaniſm. The Arabians, like the Mahometans, to give the ſanction of authority to their errors, have pretended to deduce their origin from the father of the faithful. Another thing that overturns Ludewig's hypotheſis is, that Abraham's philoſophy is a mere device of the Jews, who would fain perſuade us that the origin of all arts and ſciences is to be found among them. What they ſay in ſupport of the queen of Sheba's coming to viſit Solomon on the fame of his wiſdom, or of the wiſe men who came out of the Eaſt to Jeruſalem, will prove nothing more than has been advanced before. Let it be granted that this queen was born in Arabia, is it proved ſhe was of the ſect of the Sabians? No one will pretend to deny her to have been the moſt expert and ſagacious woman of her time, and that ſhe frequently puzzled all the kings of the Eaſt with her wiſe queſtions; becauſe the ſacred writings have given this account of her. But what has this to do with the philoſophy of the Arabians? We acknowledge very freely that the Magi who came out of the Eaſt were Arabians; that they were not without ſome knowledge of the courſes of the ſtars: we do not abſolutely exclude the Arabians from this ſcience, and admit they ſpoke their native language well; ſucceeded in ſome works of invention, as oratory, poetry, &c. but we are not to infer from hence that they were philoſophers, and had applied themſelves induſtriouſly to the cultivation of this part of literature.

A ſecond argument in favour of the philoſophy of the ancient Arabians, and which is urged as a very forcible argument too, is the hiſtory of Sabianiſm, which neceſſarily implies philoſophical knowledge, ſuppoſing all to be true which is ſaid about it. We cannot conclude any thing from thence in favour of this opinion: for Sabianiſm is in itſelf a mixture of ſhameful idolatry and ridiculous ſuperſtition; much more likely to ſubvert and extinguiſh reaſon, than propagate true philoſophy; beſides, it is not agreed in what age this ſect firſt appeared. Men of the greateſt eminence for learning, who have laboured to give light to this paſſage in hiſtory, as Hottinger, Hyde, Pocock, and eſpecially the learned Spencer, confeſs that there is no mention made of this ſect, either by the Greeks or Romans.

We muſt take care not to confound theſe Sabians of Arabia with thoſe mentioned in the annals of the ancient eaſtern church, which were half Jews half Chriſtians; and boaſted of being the diſciples of St. John the Baptiſt; great numbers of whom, even to this day, inhabit the city of Baſſora, near the banks of the Tigris, and the neighbourhood of the Perſian ſea. The famous Moſes Maimonides has extracted a large account of this ſect from the Arabic writers, and by examining their extravagant and ſuperſtitious ceremonies with attention, has very ingeniouſly juſtified the laws of Moſes in general; which, at firſt might give offence to delicacy, if the wiſdom of theſe laws was not ſhewn by their oppoſition to the laws of the Sabians. A ſtronger barrier could not be put between the Jews and Arabians, who were their neighbours.

The Arabian philoſophy was entirely Sabian, and included the ſyſtem and ceremonies of that ſect of idolators. This was what Mahomet laboured ſo ſtrenuouſly to aboliſh; and he is even ſaid by ſome to have carried his oppoſition ſo far as to prohibit the very ſtudy of philoſophy. But his followers by degrees got over that reſtraint; the love of learning increaſed, and the philoſophy of Ariſtotle was eſtabliſhed among them, during the memorable caliphate of Al-Mamon. Avicenna flouriſhed in the eleventh century, and Averrhoes an hundred years after him; ſo that the honour of tranſlating the Greek philoſophy into Arabic, cannot belong to them, notwithſtanding what has been ſaid on that ſubject; though they were doubtleſs the chief propagators of it through the countries of Europe.

Their method of philoſophizing was faulty; they followed Ariſtotle implicitly, and run into all the ſtrange ſuperſtitions of aſtrology. They founded ſchools and academies, became fond of ſubtilties and diſputation, and ſoon divided into different ſects.

As they choſe Ariſtotle for their maſter, ſo they chiefly applied themſelves to that part of philoſophy called logic; and thus became proficients in the knowledge of words, rather than of things: whence they have been called the talking philoſophers, and maſters of the wiſdom of words. Their philoſophy was obſcured by quaint arbitrary terms and notions, and on theſe, inſtead of evident principles, their demonſtrations were founded.

ARABIAN *Poetry*, in the moſt ancient times, was no other than rhiming; for it was deſtitute both of meaſure and cadence. But about the cloſe of the eighth century, and during the caliphate of Al-Rachid, it became an art, and was regulated by laws of proſody. It however ſtill makes no diſtinction between long and ſhort ſyllables, the whole depending on rhime, a certain number of letters, and the obſervation of certain cenſuræ, formed by carefully diſtinguiſhing the moveable from the quieſcent conſonants. A ſyllable to which a quieſcent letter is added at the end, becomes long by poſition; and, on the contrary, that ſyllable ſhort where it is wanting.

Renaudot tells us, that the Arabian compoſitions in verſe are ſtill wild and irregular, being neither epic, dramatic, nor lyric, in ſhort, not reducible to any particular kind. Their hymns to the deity, and their tales, are in the ſame ſtyle. Their compariſons, in which they abound, are taken, with very little choice, from tents, camels, hunting, and the ancient manners of the Arabs.

ARABIAN *Phyſic*, and *Phyſicians*, ſucceeded the Grecian, and handed down the art to us, with conſiderable improvements, chiefly in the pharmaceutical and chemical parts.

ARABICI, in eccleſiaſtical hiſtory, the name of a ſect of heretics that appeared in Arabia during the reign of the emperor Severus, about the year 207. Their hereſy conſiſted in holding that the ſoul both dies and riſes again with the body. Origen confuted them ſo fully, that they ingenuouſly acknowledged their error.

Gum ARABIC. See GUM *Arabic*.

ARABISM, an idiom or manner of ſpeaking peculiar to the Arabs, or Arabic language.

ARABLE *Land*, in huſbandry, that which is fit for tillage, or has actually been plowed.

The word is derived from the Latin, *aratrum*, a plow.

ARAC, or ARRAC, a ſpirituous liquor imported from the Eaſt-Indies.

It is extracted from a vegetable juice called toddy, which flows by inciſion from the cocoa-nut tree. This juice, after being fermented, is diſtilled in the common manner, and the produce is the arac.

ARACHNOIDES, in anatomy, is an appellation given to ſeveral different membranes, as the tunic of the cryſtalline humour of the eye, the external lamina of the pia mater, and one of the membranes of the ſpinal marrow.

The word is Greek, and compounded of αραχνη, a ſpider, or ſpider's-web, and ειδος, reſemblance; the fineneſs of theſe membranes being ſuppoſed to reſemble that of the ſpider's web.

ARÆOMETER, or WATERPOISE, an inſtrument for meaſuring the weight of liquors; which is uſually made of a thin glaſs ball, with a long tapering neck, hermetically ſealed at the end, after as much mercury has been put in as will keep it ſwimming in an upright poſture. The neck is divided into ſeveral parts to ſhew the different denſities of the different liquors into which it is put to ſwim; for the lighter the fluid the deeper the glaſs ball will ſink; and vice verſa. See HYDROMETER.

ARÆOPAGUS. See AREOPAGUS.

ARÆOSTYLE, in architecture, a term uſed by ſome architects to ſignify the greateſt interval that can be made between two columns, which conſiſts of eight modules or four diameters. See MODULE.

ARÆOTICS, in medicine, remedies which rarify the humours, and render them proper for being carried off by perſpiration through the pores of the ſkin.

The word is formed from the Greek, αραιωτικος, which is derived from αραιοω, to rarify.

ARAIGNEE, in the military art, ſignifies the branch, return, or gallery of a mine. See the article MINE.

ARANEA TUNICA, or ARANEOSA, in anatomy; ſee the article ARACHNOIDES.

ARANEA CONCHA, the ſpider-ſhell, in natural hiſtory, a name given to ſeveral ſpecies of the murex. See MUREX.

ARBA-

ARBALET, in antiquity, a kind of weapon, generally called at preſent a croſs-bow. See the article CROSS-BOW.

The antients had alſo large machines of the ſame kind for throwing ſeveral arrows at a time. Theſe were generally called baliſtæ. See BALISTA.

ARBITER, in the civil law, implies a judge nominated by the magiſtrate, or choſen voluntarily by the two contending parties, in order to decide their differences according to law.

The civilians make a difference between arbiter and arbitrator, though both found their power on the compromiſe of the parties; the former being obliged to judge according to the cuſtoms of the law, whereas the latter is at liberty to uſe his own diſcretion, and accommodate the difference in the manner that appears to him moſt juſt and equitable.

ARBITRARY, whatever is left to the choice or determination of men, or not fixed by any poſitive law or injunction. Thus arbitrary fines are mulcts impoſed at the pleaſure of the court or judge.

ARBITRARY *Power*. See DESPOTISM.

ARBITRATION, ARBITRAGE, or ARBITRAMENT, a power given by two or more contending parties to ſome perſon or perſons to determine the diſpute between them.

ARBITRATOR, a private extraordinary judge, choſen by the mutual conſent of both parties, to determine controverſies between them.

ARBOR, the Latin appellation for any tree in general.

ARBOR *Dianæ*. See DIANÆ *Arbor*.

ARBOR *Vitæ*. See THUYA.

ARBOR, in mechanics, the chief or principal part of a machine, or that part which ſuſtains the reſt; thus the axis, or ſpindle, on which the machine turns is called the arbor, as the arbor of a wind-mill, the arbor of a water-wheel, of a gin, &c.

ARBORESCENT, a term applied to all ſuch things as reſemble trees; thus we read of arboreſcent ſhrubs, arboreſcent animals, &c. of which laſt kind is that great natural curioſity the ſtar-fiſh.

ARBORIST, a perſon ſkilled in the nature and management of trees.

ARBOUR, in gardening, a ſhady place to ſit in, formed of lattice-work, and entirely covered, except the entrance, with clipped trees, as elms, limes, hornbeam, &c. or with twining plants, as jeſſamines, honeyſuckles, &c. Arbours now are not ſo much in eſteem as formerly, they being unhealthful to ſit in, except in very hot and dry weather, and likewiſe expenſive to keep in repair, the wood-work ſoon rotting by being continually in the ſhade, and excluded from the free air. Thoſe that delight in arbours may make them without lattice-work, by planting elms, &c. of about nine or ten feet high, at the diſtance of three feet in the line on each ſide, and faſtening their tops together ſo as to form an arch, but as they are apt to get bare at their bottoms, it may be neceſſary to plant between each a ſhorter tree, filling the interſtices with honey-ſuckles, jeſſamines, &c. which will make the whole quite full, and by being properly kept clipped, it will appear very handſome.

ARBUTUS, the ſtrawberry-tree, in botany, a genus of ever-green trees, producing oblong leaves ſawed at the edges, the flower is monopetalous and ovated, divided into five ſegments at the brim, which are reflexed; it hath ten ſhort filaments joined to the bottom to the corolla, topped with bifid antheræ. At the bottom of the flower is placed a globular germen ſupporting a cylindrical ſtyle, crowned with a thick blunt ſtigma: the germen afterwards turns to a roundiſh berry very like a ſtrawberry, from whence the Engliſh name is taken, but divided into five cells, in which are contained many ſmall ſeeds.

There are five ſpecies in this genus: 1. The common arbutus. 2. Arbutus with plain leaves, called by ſome adrachne. 3. Arbutus, called the bilberry of Arcadia, with alaternus leaves. 4. Arbutus, called the bilberry, with oblong whitiſh leaves. 5. Arbutus, called *uva urſi*, or bear-berries. With two or three varieties of the firſt ſort.

The fruit of the common arbutus being ripe at the latter part of the year, the ſeeds ſhould be waſhed from the pulp, and preſerved in dry ſand till the month of March, when they ſhould be ſown in pots, and plunged in old tan, on a moderate hot-bed, which will be ſerviceable to promote vegetation. The ſeeds will ſoon come up, when they muſt be kept frequently watered during the ſummer: in autumn, the young plants may be placed ſingly in ſmall pots, and plunged in old tanners bark, under glaſſes during the winter, and ſhould be protected from the froſts by proper covering. The ſucceeding winter they ſhould be hardened to the weather, more than in the preceding, by covering them only with matts in ſevere weather, ſo that they may the following winter be ſo much inured to the climate, as to bear planting in the ſhrubbery, where they are deſigned to remain, which ſhould be in the ſpring following. Theſe plants may be alſo propagated by cuttings, or layers; but the beſt are thoſe raiſed from ſeeds.

ARC, or ARCH. See the article ARCH.

The word is formed from the Latin, *arcus*, bow.

ARCANUM, a ſecret, generally uſed to imply a remedy, whoſe compoſition is concealed, in order to increaſe its value.

ARCA CORDIS, in anatomy, the ſame with pericardium. See PERICARDIUM.

ARCA-

ARCADIANS, the name of a ſociety of men of letters, who formed themſelves into a body at Rome, in the year 1690, with a deſign to preſerve learning, and carry Italian poetry to perfection.

They took the name of Arcadians, partly from the rules of their ſociety, and partly from every new member's aſſuming, on his admiſſion, the name of ſome ſhepherd of ancient Arcadia. Once in four years they elect a preſident, under the title of guardian, appointing him twelve fellows, who decide all affairs of the ſociety. The famous Chriſtina, queen of Sweden, was their firſt patroneſs. They reckon by Olympiads, and celebrate their feſtivals of wit every fourth year.

ARCBOUTANT, in building, an arched buttreſs. See BUTTRESS.

ARCH, in geometry, any part of a curved line intercepted between two points.

ARCH *of a Circle* is any part of its circumference.

Circular ARCHES are of three kinds, viz. ſemicircular arches, ſkene arches, and arches of the third and fourth point.

Semicircular ARCHES are ſuch as have their centers in the middle of a line, joining the two feet together.

Skene ARCHES are ſegments of circles, containing ſometimes more than 90°. and ſometimes leſs.

ARCHES *of the third and fourth point*, or *Gothic* ARCHES, are ſuch as conſiſt of two arches of a circle, meeting in an angle at the vertex of the arch, being drawn from the diviſion of a chord into three or four parts at pleaſure.

Catenarian ARCH. See CATENARIAN.

Diurnal ARCH, in aſtronomy, is that curve or part of a circle deſcribed by a ſtar, planet, &c. from its riſing and ſetting.

Elliptical ARCHES are ſemi-ellipſes, uſually deſcribed by workmen on three centers.

Equal ARCHES are ſuch as contain the ſame number of degrees of a circle, ſwept with the ſame radius.

Mural ARCH. See MURAL *Arch*.

Nocturnal ARCH is that part of a circle deſcribed by a ſtar or planet from its ſetting to riſing.

ARCH *of Direction*, or *Progreſſion*, is the arch of the zodiac which a planet appears to move over when in conſequentia, or according to the order of the ſigns.

ARCH *of retrogradation*, is an arch of the zodiac deſcribed by a planet when in its retrograde motion, or its motion contrary to the ſigns.

ARCH, in architecture, a concave building with a mould bent in form of a curve, erected to ſupport ſome ſtructure.

Triumphal ARCH, a ſtately gate of a ſemicircular form, adorned with ſculpture, inſcriptions, &c. erected in honour of thoſe who had deſerved a triumph.

ARCH *of Viſion*, is an arch of a vertical circle, intercepted between the center of the ſun, after its ſetting, and the horizon, when a ſtar before was hid in its rays, and again begins to appear.

Strait ARCHES are thoſe uſed over doors and windows, having plain ſtrait edges both above and below, parallel to each other, but both the ends and joints pointing to a center.

THEORY *of arches*. See the article BRIDGE.

ARCHÆUS. See ARCHEUS.

ARCHANGEL, in ſcripture, ſignifies a divine and ſpiritual being, who is ſent by the Almighty on extraordinary occaſions to declare his will, or execute his commands. He is the ſecond in the third hierarchy. See ANGELS, HIERARCHY.

The word is compounded of the Greek ἀγγελος, a meſſenger, and ἀρχος, chief.

ARCHBISHOP, a prelate who has ſeveral ſuffragan biſhops under him. The name was not known in the firſt ages of the church, but was invented by the Greeks, from whom it paſſed into the weſtern churches. In the infancy of Chriſtianity, they made uſe only of the word biſhop, and when they would diſtinguiſh one who had other biſhops under him, they called him the firſt biſhop. Some are of opinion, that the patriarchs of Alexandria gave themſelves firſt of all the name of archbiſhop, when other biſhops were created in Egypt, where there had formerly been no more than the patriarch, the only biſhop.

The juriſdiction of an archbiſhop conſiſted originally in ordaining, or ratifying the ordinations of all other biſhops; and once a year he was to ſummon them all to a ſynod, in which he preſided, to enquire into their conduct, and cenſure them with ſuſpenſion, or deprivation; as alſo to hear and determine cauſes between contending biſhops.

The firſt eſtabliſhment of archbiſhops in England, if we may credit Bede, one of the moſt antient writers of the Engliſh nation, was, in the time of Lucius, ſaid to be the firſt Chriſtian king in England, who, after the converſion of the people, erected three archbiſhopricks, in London, York, and Landaff. The dignity of archbiſhop continued in the ſee of London 180 years; when it was tranſlated to Canterbury, where it has remained ever ſince. York is a metropolitan ſee to this day. The archbiſhop of Canterbury is ſtiled, "Primate and Metropolitan of ALL England;" and the archbiſhop of York, "Primate and Metropolitan of England."

ARCHBUTLER, one of the great officers of the German empire, who preſents the cup to the emperor on ſolemn occaſions. This office belongs to the king of Bohemia.

ARCHCHAMBERLAIN, an officer of the empire, nearly the ſame with the great chamberlain of England. The elector of Brandenburgh was appointed archchamberlain, by the golden bull.

ARCHCHANTOR, the preſident of the chantors of a cathedral or collegiate church.

ARCHDEACON, the name of an eccleſiaſtical dignitary, whoſe buſineſs it is in the pariſhes ſubject to his juriſdiction, to enquire into the repair of churches, reform abuſes, ſuſpend, excommunicate, &c.

In England there are ſixty archdeacons.

ARCH-DUKE, a title given to dukes of greater authority and power than other dukes.

ARCHE, among phyſicians, implies the beginning or firſt period of a diſeaſe.

The word is Greek, ἀρχὴ, and ſignifies beginning.

ARCHED *Legs*, in horſemanſhip, when the knees of a horſe are bended in the form of an arch. This is reckoned a very great fault, and is often occaſioned by hard travelling.

ARCHER, in the ancient military art, implied a perſon who fought with a bow and arrows.

ARCHES, or *Court of* ARCHES, the ſupreme court belonging to the archbiſhop of Canterbury, to which appeals lie from all the inferior courts within his province.

ARCHETYPE, the firſt or original model of a work, which is copied after to make another like it.

The word is compounded of the Greek, ἀρχὴ, beginning, and τύπος, a type.

This term is uſed by minters, to ſignify the ſtandard weight by which the others are adjuſted.

ARCHEUS, among chemiſts, implies the predominating principle of things, whereby their peculiar qualities are fixed and determined. Others, however, mean by this term a certain univerſal ſpirit diffuſed through the whole creation, and which is the active cauſe of all the phænomena in nature. They even attribute ideas to the archeus, and thence call them archeal ideas.

ARCHIATOR, the chief or principal phyſician of a prince, who retains ſeveral of the faculty.

The word is Greek, ἀρχιατρὸς, and compounded of ἀρχὴ, chief, and ἰατρὸς, a phyſician.

ARCHIL, *Archilla*, in botany, a whitiſh moſs growing upon rocks in the Canary and Cape Verd Iſlands, and which yields a rich purple tincture, fugitive indeed, but extremely beautiful.

This weed is imported to us as it is gathered: thoſe who prepare it for the uſe of the dyer, grind it betwixt ſtones, ſo as to thoroughly bruiſe, but not reduce it into powder, and then moiſten it occaſionally with a ſtrong ſpirit of urine, or urine itſelf mixed with quick-lime: in a few days it acquires a purpliſh red, and at length a blue colour: in the firſt ſtate it is called archil, in the latter lacmus, or litmoſe.

The dyers rarely employ this drug by itſelf, on account of its dearneſs and the periſhableneſs of its beauty. The chief uſe they make of it is, for giving a bloom to other colours, as pinks, &c. This is effected by paſſing the dyed cloth or ſilk through hot water lightly impregnated with the archil. The bloom thus communicated, ſoon decays upon expoſure to the air. Mr. Hellot informs us, that by the addition of a little ſolution of tin this drug gives a durable dye: that its colour is at the ſame time changed towards a ſcarlet; and that it is the more permanent, in proportion as it recedes the more from its natural colour.

Prepared archil very readily gives out its colour to water, to volatile ſpirits, and to ſpirit of wine: it is the ſubſtance principally made uſe of for colouring the ſpirits of thermometers. As expoſure to the air deſtroys its colour upon cloth, the excluſion of the air produces a like effect in theſe hermetically ſealed tubes; the ſpirits of large thermometers becoming, in the compaſs of a few years, colourleſs. M. l'Abbè Nollet obſerves (in the French Memoirs for the year 1742) that the colourleſs ſpirit, upon breaking the tube, ſoon reſumes its colour, and this for a number of times ſucceſſively; that a watery tincture of archil, included in the tubes of thermometers, loſt its colour in three days; and that in an open deep veſſel it became colourleſs at the bottom, whilſt the upper part retained its colour.

A ſolution of archil in water, applied on cold marble, ſtains it of a beautiful violet or purpliſh-blue colour, far more durable than the colour which it communicates to other bodies.

Mr. du Foy ſays he has ſeen pieces of marble ſtained with it, which in two years had ſuffered inſenſible change. It ſinks deep into the marble, ſometimes above an inch; and at the ſame time ſpreads upon the ſurface, unleſs the edges be bounded by wax, or other like ſubſtances. It ſeems to make the marble ſomewhat more brittle.

Linnæus informs us, in the Swediſh Tranſactions for the year 1742, that the true archil moſs is to be found on the weſtern coaſts of England; and ſuſpects that there are ſeveral other more common moſſes from which valuable colours might be extracted. A quantity of ſea-moſs having rotted in heaps upon the ſhore, he obſerved the liquor in the heaps to look like blood; the ſea-water, the ſun, and the putrefaction, having brought out the colour. Mr. Kalm, in an appendix to Linnæus's paper in the year 1745, mentions two ſorts of moſſes actually employed in ſome parts of Sweden for dying woolen red: one is the *Lichenoides coralliforme apicibus coccineis* of Ray's Synopſis; the other the *Lichenoides tartareum farinaceum, ſcutellarum umbone fuſco*, of Dillenius. This laſt is a white ſubſtance, like meal clotted together, found on the ſides and tops of hills. It is ſhaved off from the rocks after rain, purified from the ſtony matters intermixed among it

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by washing with water, then dried in the sun, ground in mills, and again washed and dried: it is then put into a vessel with urine, and set by for a month. A little of this tincture, added to boiling water, makes the dying liquor. In the same Transactions for the year 1754, there is an account of another moss, which, prepared with urine, gives a beautiful and durable red or violet dye to wool and silk. This is the *Lichen foliaceus, umbilicatus, subtus la cunosus, Linn. flor. Suec.* It grows upon rocks, and is readily distinguished from others of that class, by its looking as if burnt or parched; consisting of leaves as thin as paper, convex all over on the upper side, with corresponding cavities underneath, adhering firmly to the stones by a little root under the leaves, and coming asunder, when dry, as soon as touched. It is gathered after rain, as it then holds best together, and parts easiest from the stone.

In France, a crustaceous moss, growing upon rocks in Auvergne, is prepared with lime and urine, and employed by the dyers as a succedaneum to the Canary archil, to which it is said to be very little inferior: it is called orseille d'Auvergne, or perelle. Mr. Hellot relates, that he has met with several other mosses, which, on being prepared in the same manner, acquire the same colour. The most expeditious way, he says, of trying whether any moss will yield an archil or not, is, to moisten a little of it with a mixture of equal parts of spirit of sal ammoniac and strong lime-water, and add a small portion of crude sal ammoniac; the glass is then to be tied over with a piece of bladder, and set by for three or four days. If the moss is of the proper kind, the little liquor which runs from it upon inclining the vessel, will appear of a deep crimson colour; and this afterwards evaporating, the plant itself acquires the same colour. *Lewis's Notes on Neumann's Chemistry.*

ARCHILOCHIAN, a name given to a species of verse invented by Archilochus, a poet of Paros, one of the isles of Cyclades. This poet was promised by Lycambus that he should have his daughter in marriage, but was deceived by him; which so irritated the bard, that he wrote some severe iambics against him, which touched him so sensibly, as to make him hang himself. Horace alludes to this, when he says,

Archilochum proprio rabies armavit Iambo.

Iambics, according to Quintilian, were invented by him, *Archilochus primus inter eos, qui Iambo scripsere; summa in eo vis, elegantes sane, vibrantesque sententiæ; plurimum sanguinis et nervorum.* "Archilochus was one of the first who wrote Iambics; he has amazing power; his thoughts are elegant and striking; and he is possessed of the greatest strength and vigour." There is another species of verse called after him, which consists of seven feet, whereof the four first are generally dactyls, though sometimes spondees, and the three last trochees: such is this of Horace,

Jam Cytherea choros ducit Venus, imminente lunâ.

ARCHIMANDRITE, was anciently the name given to a superior of a convent, and answers to what is now called a regular abbot. The word *mandrite* is Syriac, and signifies a recluse or monk.

ARCHIPELAGO, in geography, a part of the sea, containing, or interrupted by, many little islands; but is most commonly applied to that part between Greece and Asia.

ARCHISYNAGOGUS, the chief of the synagogue; the title of an officer among the Jews, who presided in their synagogues and assemblies.

The number of these officers was not fixed, nor the same in all places; there being seventy in some, and in others only one. They are sometimes called princes of the synagogue, and had a power of excommunicating such as deserved that punishment.

ARCHITECT, a person well skilled in architecture, who delineates, or draws plans of edifices, conducts the work, and directs the artificers employed therein.

ARCHITECTONIC, something endowed with the power and skill of building, or calculated to assist the architect.

ARCHITECTURE, the art of erecting edifices or buildings, whether for habitation or defence.

Mankind has varied their abodes from time to time, according to local conveniencies, and according to the different genius and character of every people and nation. The first method of building houses that we have any idea of since the deluge, is that of the children of Noah in Gorduena, or Curdistan, where the ark rested. The appendices of rocks, caves, and hollow places dug under the ground, were the first retreats of their families, as soon as they encreased in number in that mountainous land; these were the places they sheltered themselves in from rains and sharp winds, but not from damps and obscurity. The barrenness of those regions soon drove them over the river Tigris, into the plains of Mesopotamia. Here the want of stone, or any other hard matter fit for making them shelters, taught them the art of brick-making, and hence the art of masonry. For mortar they made use of viscous bitumen, which they mixed or thickened with reeds, or straw cut small. The woods which were easily found almost in every place, they soon learned was the most pliant, as well as durable matter, for making roofs and linings, as well as pieces for support. Strangers to skill and experience, they at first contented themselves with huts, or green arbours, void of symmetry or proportion; but as wood took whatever form they pleased to give it, the

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tools, which they gradually invented, taught them by degrees to turn it into hurdles, poles, beams, joists, boards, laths, and pieces of all shapes and magnitudes: therefore, we may reckon the pliantness of the wood, and the skill of the hurdler and carpenter, to be the first causes to which we are indebted for this manner of building, which was most universal in the beginning, and which has rendered the earth truly habitable.

The Egyptians, after having minutely examined the two sides of the Nile, fixed their abodes in the plains which it most fertilized, and brought thither by help of navigation, stone, marble, and other matter for building, which they found in great plenty at the farther end of Africa. Hence those magnificent buildings in form of terrasses; and those lofty monuments, which are found superior to inundations, and not to be destroyed by all the efforts of water.

The elegance that shines throughout the writings of the Greeks is likewise found in their architecture, and in all their inventions. We had from them the first operations of geometry, the correctness of drawing the several orders of architecture, the beautiful proportions in every thing, and the principles of all the liberal arts.

The Romans, less civilized, at first built their houses with wood, earth, and stubble: nevertheless, a spirit of nobleness appears in their primitive simplicity; for they never spared any thing to perfect the edifices for common utility.

The inconveniencies and decay of wooden buildings brought masonry more and more into request, both for public and private use; society was a double gainer by it; the structures becoming at once more elegant and more commodious: at the same time timber, so necessary in navigation, and in so many other purposes, was considerably spared. It has, however, still a principal share in the construction of most buildings; it sometimes supplies the whole carcase, or what is commonly called the frame, which is afterwards filled up with slight masonry; it likewise is used in the division of stair-cases; and is indispensably necessary to tie in the walls, and to preserve the whole by the shelter of the roof.

In the time of Tarquin the Elder, the Romans channelled their whole town, and inwardly traversed it by many large canals of masonry, which like so many branches of one trunk, terminated in a common conduit, that was arched and accessible to their scavengers, that the foul water of all their houses, at any time, might be discharged into the Tiber. But the greatest emulation of the Roman wealthy citizens was to bring wholesome water into Rome, for the service of the people; to erect very spacious buildings, where their youth might strengthen their constitution by bodily exercise; to build large porticos, adorned with statues, where the people might at any time find shelter, when they were to make any purchases, or to study the monuments and history of their own country.

Villalpandis asserts, that Solomon was the first that reduced architecture to any tolerable order; and that the Tyrians employed by that prince in building the Temple learned the art from him, and carried it afterward into their own country: and to what pitch of magnificence and grandeur the Tyrians carried it before it reached the Greeks, may be learned from Isaiah xxiii. 8. Yet, according to the common account, architecture should be almost wholly of Grecian original: three of the regular orders, or methods of buildings, being denominated from them, viz. Corinthian, Doric, and Ionic, and scarce a single member, or moulding, but what comes to us with a Greek name. The Romans were ignorant of any other order besides the Tuscan, till they received them from the Greeks; nor did they appear till then to have any other idea of the grandeur and beauty of edifices, but what arose from their magnitude and strength. Various have been the ebbings and flowings of architecture since the time of Augustus, when it was reckoned in its glory. Apollodorus, by the encouragement of the emperor Trajan, raised the famous and much admired Trajan's column, which subsists to this time, as an example to shew to what perfection architecture was arrived at that time. However, it now began to dwindle; nor was Alexander Severus, who took great delight in this art, able to support it; for it fell with the western empire, and was not retrieved for the space of twelve centuries.

In the fifth century, all the beautiful monuments of antiquity were destroyed by the Visigoths; and architecture from that time became coarse and artless, till the time of Charlemagne, who used his utmost endeavours to restore it; as likewise did the French with some success, by the encouragement of Hugh Capet, and his son Robert, who continued to prosecute his design.

In the thirteenth and fourteenth century, the beauty of architecture consisted wholly in a multitude of ornaments, and great delicacy, though frequently all their solicitude and care was without conduct or taste.

During the two last centuries the modern architects have used their utmost efforts to reinstate the primitive simplicity and beauty of ancient architecture; so that all our grand and public edifices are built after the manner of the antique, and some of them not far inferior to those celebrated structures.

Architecture is commonly divided in three parts, viz. civil, military, and naval.

Civil ARCHITECTURE is the art of contriving and executing commodious buildings for the use of society,

ſociety, and the conveniency of civil life. In this part our chief regard ſhould attend to conveniency, ſtrength, beauty, decorum, and œconomy. The conveniency is the matter principally to be conſidered in the plan of a building, ſo to order the parts thereof, that they may anſwer the intention of the work, and not embarraſs one another. The ſtrength depends on the choice and goodneſs of the materials, and upon the ſolidity of the foundation, the ſquaring, levelling, and plumbing of the walls, &c. and a due attention of the bearings of every part. The beauty, in an exact order or ſymmetry, which ſhould be obſerved in every part, ſo that one member does not exceed its proportion in regard to another member, and that when compleat, they ſhould altogether exhibit an agreeable form and appearance. Decorum teaches the architect to have a regard to deſign, cuſtom, and nature: and œconomy, to conſider the expence, in order to regulate the form and manner of the deſign.

Vitruvius, among all the ancients, is the only entire author on architecture: he compoſed ten books on that ſubject, which he dedicated to Auguſtus, in whoſe time he lived. Beſides him, Baptiſta, Alberti, Palladio, Scamozzi, Blondel, Goldman, Perrault, Walton, Sturmius, and Wolfius, are celebrated for writing on architecture.

Military ARCHITECTURE inſtructs us in the method of fortifying cities, camps, ſea-ports, &c. See FORTIFICATION.

Naval ARCHITECTURE is the art of fabricating the hull or lower frame of a ſhip; diſtinct from the ſuperſtructure that comprehends her machinery and furniture for ſailing; which laſt, we ſhall explain under the articles, MAST, SAILS, and RIGGING.

To whom the world is indebted for the invention of ſhips is, like all other things of equal antiquity, uncertain: if we liſten to the fables of the poets, we ſhall be extremely divided in our opinion amongſt the variety of competitors. Prometheus, Neptune, Janus, Atlas, Hercules, Jaſon, Danaus, Erythraeus, &c. appear with ſufficient authority to claim our aſſent: but Minerva, the auſpicious parent of arts and ſciences, ſeems to have a ſuperior title, and to her, probably with more propriety, it has been attributed by fame.

But ſome who reject theſe fabulous traditions, and pretend to greater certainty in their allegations, aſcribe it to the inhabitants of ſome places that border on the ſea, and ſeem appropriated by nature for harbouring ſhips, ſuch as the Phœnicians, Aeginenſians, &c. This difference of opinions appears naturally to have ariſen, on obſerving the various places where navigation was firſt practiſed, or from the different conſtruction and equipage of ſhips; ſome of which having been built by the above-mentioned perſons, have entitled them to the whole invention.

A very ſmall portion of art or contrivance was ſeen in the firſt ſhips; they were neither ſtrong nor durable, but conſiſted only of a few planks laid together, without beauty or ornament, and juſt ſo compacted as to keep out the water. In ſome places they were only the hulks or ſtocks of trees hollowed, and then conſiſted only of one piece of timber; nor was wood alone applied to this uſe, but any other buoyant materials, as the Egyptian reed papyrus, or leather, of which the primitive ſhips were frequently compoſed; the bottom and ſides being extended on a frame of thin battons or ſcantlings, of flexible wood, or begirt with wickers, ſuch as we have frequently beheld amongſt the American ſavages ourſelves. In this manner they were often navigated upon the rivers of Ethiopia, Egypt, and Sabaean Arabia, even in later times. But in the firſt of them, we find no mention of any thing but leather or hides ſewed together. In a veſſel of this kind, Dardanus ſecured his retreat to the country afterwards called Troas, when he was compelled by a terrible deluge, to forſake his former habitation of Samothrace. According to Virgil, Charon's infernal boat was of the ſame compoſition.

But as the other arts extended their influence, naval architecture likewiſe began to emerge from the gloom of ignorance and barbariſm; and as the ſhips of thoſe ages were increaſed in bulk, and better proportioned for commerce, the appearance of thoſe floating citadels of unuſual form, full of living men, flying with ſeemingly expanded wings, over the ſurface of the untravelled ocean, ſtruck the ignorant people with terror and aſtoniſhment: and hence, as we are told by Ariſtophanes, aroſe the fable of Perſeus flying to the Gorgons, who was actually carried thither in a ſhip! Hence, in all probability, the famous ſtory of Triptolemus riding on a winged dragon is deduced, only becauſe he ſailed from Athens, in the time of a great dearth, to a more plentiful country, to ſupply the neceſſities of his people. The fiction of the flying horſe Pegaſus may be joined with theſe, who, as ſeveral mythologiſts report, was nothing but a ſhip with ſails, and thence ſaid to be the offspring of Neptune, the ſovereign of the ſea: nor does there appear any other foundation for the ſtories of griffons, or of ſhips transformed into birds and fiſhes, which we ſo often meet with in the antient poets. So acceptable to the firſt ages of the world were inventions of this nature, that whoever made any improvements in navigation, or naval architecture, building new ſhips better fitted for ſtrength or ſwiftneſs than thoſe uſed before, or rendered the old more commodious by additional contrivances, or diſcovered countries unknown to former travellers,

lers, were thought worthy of the greateſt honours, and often aſſociated into the number of their deified heroes; hence we have in aſtronomy the ſigns of Aries and Taurus, which were no other than two ſhips, the former tranſported Phryxus from Greece to Colchos, and the latter Europa from Phœnicia to Crete. Argo, Pegaſus, and Perſeus's whale, were likewiſe new ſhips of a different ſort from the former, which, being greatly admired by the barbarous and uninſtructed people of thoſe times, were tranſlated amongſt the ſtars, in commemoration of their inventors, and metamorphoſed into conſtellations by the poets of their own and of ſucceeding ages.

Originally all ſhips, for whatever uſe deſigned, appear to have been of the ſame form; but the various purpoſes of navigation ſoon occaſioned a conſiderable difference, in their ſize, conſtruction, and equipage, at which time they became chiefly characterized as veſſels of war, burthen, or paſſage.

The ſhips of war of the ancients were diſtinguiſhed from other kinds of veſſels, by various turrets and acceſſions of building, ſome to defend their own ſoldiers, and others to annoy the enemy; and from one another, in later ages, by ſeveral degrees or ranks of oars, the moſt uſual number of which was four or five, which appear not to have been arranged, as ſome imagine, on the ſame level in different parts of the ſhip; nor yet, as others have ſuppoſed, directly above one another's heads; but their ſeats being placed one behind another, aſcended gradually like ſtairs. Ptolomy Philopater, urged by a vain-glorious deſire of exceeding all the world beſides in naval architecture, is ſaid to have farther enlarged the number of banks to forty, and the ſhip being otherwiſe in equal proportion, this raiſed her to ſuch an enormous bulk, that ſhe appeared at a diſtance like a floating mountain or iſland, and, upon a nearer view, like a prodigious caſtle on the ocean: ſhe contained four thouſand rowers, four hundred ſailors employed in other ſervices, and near three thouſand ſoldiers. But this, and all ſuch monſtrous fabrics, ſerved only for ſhew and oſtentation, being rendered by their vaſt bulk unweildy and unfit for ſervice. Athenaeus informs us, the common names they were known by, were Cyclades, or Aetna, i. e. iſlands, or mountains, to which they ſeemed nearly equal in bigneſs; conſiſting, as ſome report, of as many materials as would have compoſed fifty triremes, or ſhips of three banks. Thus much we thought neceſſary to ſay concerning the naval architecture of the antients; for the ſeveral ornaments, furniture, and inſtruments of war, ſee Scheffer, or Potter's Antiq. b. ii. c. 14, 15, 16, &c. To this we ſhall add, a general ſketch of the art, as it has been improved by the moderns, and appears at this day. See NAVIGATION, SHIP.

Naval architecture then may be comprehended in three principal articles. 1. To give the ſhip ſuch a figure, or outward form, as may be moſt ſuitable to the ſervice for which ſhe is intended. 2. To find the exact ſhape of all the pieces of timber neceſſary to compoſe ſuch a fabric. 3. To make convenient apartments for the artillery, ammunition, proviſions, and cargo, together with ſuitable accommodations for the officers and men.

In order to give the bottom a proper figure, all the qualities neceſſary to make her anſwer the ſervice for which ſhe is deſigned ſhould be conſidered. A ſhip for the merchant's ſervice ſhould ſtow her cargo well: and be ſo faſhioned as to go well, carry a good ſail, ſteer eaſily, and lie in a high ſea, without ſtraining.

Some eminent geometricians have endeavoured to diſcover the form of a ſolid that will anſwer all theſe purpoſes beſt, or meet with the leaſt reſiſtance in dividing the fluid through which it is to paſs; but have not been able to reduce their theory to practice, on account of the various ſituations in which a ſhip is obliged to lie when under ſail. The artificers thus deſpairing to eſtabliſh this point by mathematical rules, have applied themſelves entirely to experience and obſervation, which may greatly ſupply the deficiency of art; but though they may diſcover that a ſhip has bad qualities, it may be difficult to determine where they lie, or whether they are in the hull or rigging; but if their obſervations be aided by mathematical principles, it will certainly conduce very much to attain the deſired end. See EVOLUTION, TRIM, SAILING.

But as many ſhips have been built, which ſeem to anſwer every purpoſe for which they were calculated, ſome builders have ſtudied chiefly to copy thoſe which are approved by the ſeamen; and this method they very improperly regard as the principal rule to be obſerved in building. Now as the bodies of ſhips are very different, there are of courſe variety of different models adopted as ſtandards. But admitting a poſſibility to diſcover ſuch a body as ſhould give entire ſatisfaction, and have every good quality requiſite for the ſervice propoſed, yet this could, by no means, be eſtabliſhed as a ſtandard for ſhips of a different ſize to be copied from, ſince although we may have a firſt rate of 100 guns, which has been found by experience to be a very good ſhip in every reſpect; yet, we ſhould be much deceived to build a 20 gun-ſhip, in which all the parts bore a ſimilar proportion to one another, which they have in the firſt rate.

It has been remarked above, that a ſhip of war muſt carry her loweſt tier of cannon high enough above

above the water, otherwiſe a great ſhip which cannot open her lower battery, when ſailing with a freſh ſide wind, may be taken by a ſmall one that can make uſe of her cannon.

A ſhip ſhould be duly poiſed, ſo as not to dive or pitch heavily, but go ſmooth and eaſy through the water, riſing to the waves when they run high, and the ſhip has reduced her ſail to the ſtorm; otherwiſe they will break aboard and ſtrain the decks, or carry away the boats: the maſts are likewiſe in great danger from the ſame cauſe.

A ſhip ſhould ſail well when large and before the wind, but chiefly cloſe hauled, or with a ſide wind, and her ſails ſharp trimmed, and then not fall off to the leeward.

Now the great difficulty conſiſts in uniting ſo many different qualities in one ſhip, which ſeems to be nearly impoſſible; the whole art therefore is to form the body in ſuch a manner, that none of theſe qualities ſhall be entirely deſtroyed, and in giving the preference to that which is chiefly required in the particular ſervice for which the veſſel is built; but as it would protract the article to a very extraordinary length, to illuſtrate this point in every circumſtance, we ſhall only obſerve, that it is poſſible ſo to unite them all in one veſſel, that each of them may be eaſily diſcerned. When it happens otherwiſe, the fault muſt lie in the builder, who has not applied himſelf to ſtudy the fundamental rules and principles of his art. For a more circumſtantial account, we refer the reader to Du Hamel's Elem. Nav. Architect. to Bouguer's Traité du Navire; and the Engliſh reader, to Murray's Treatiſe on Ship-building and Navigation.

But, if we except ſome antient artificers poſſeſſed of a natural genius, and a few of the moderns who have been inſtructed in the principles of geometry, and have laboured hard to make a progreſs in ſhip-building, we may venture to aſſert that the greateſt number ſatisfy themſelves with copying ſhips that are eſteemed good ſailors; and a tenacious imitation of theſe ſervile mechanical methods, which are too common, have, to the great reproach of the art, produced all theſe pretended rules of proportion; for the various models they have hitherto uſed prove beyond diſpute that they have not yet found a proper ſtandard: the only reaſon why they have tried ſo many different methods, is becauſe they could not find the beſt; yet every builder confines theſe mechanical rules of deſcribing the midſhip-frame, and forming the reſt of the timbers, to his own fancy, and concealing it from the inferior artificers, who may be poſſeſſed of a genius and taſte greatly ſuperior to his own; but we would inform theſe gentlemen that this is ever regarded by the polite world as a certain characteriſtic of a narrow and vulgar education, a ſordid and illiberal diſpoſition, and a perverſe and crooked taſte!

Who ever heard, that a great architect endeavoured to conceal the proportions of the different orders of architecture? Do we not ſee every where ſyſtems of that noble art publiſhed, plans, elevations, and ſections, preſented to the general obſervation of mankind for their approbation or cenſure? But poſſibly, we are afraid that publication of ſhip-building may be dangerous in a political light, by making our enemies maſters of the ſecret. This can never be the caſe, ſince we know that our ſeventy-gun ſhips and frigates, generally eſteemed the moſt uſeful ſhips in the navy, have been all the late war entirely copied from the models of the French, who have never ſtudied to conceal them. But although the methods of deſcribing the midſhip-frame, and forming the reſt of the timbers, be known to moſt of our younger artificers, yet we have but few good maſter-builders; this requires a greater portion of genius, than the mere mechanical methods. They ſhould, at leaſt, have a ſufficient acquaintance with mathematics, phyſics, mechanics, and the nature of ſolids and fluids, to be able to diſcover what figure would procure ſome good quality, without hazarding the putting a bad one in its place. We ſhall give ſome account of the principal pieces that compoſe a ſhip, and illuſtrate the affair by a plate, referred to from the article SHIP-BUILDING.

Counterfeit ARCHITECTURE, is that which conſiſts of projections painted either in claro or oſcuro, or in colours imitating marble.

ARCHITECTURE, in perſpective, is a building wherein the members are of different diameters or modules, and diminiſh in proportion to their diſtance, in order to make the edifice or ſtructure, appear longer to the eye than it really is.

ARCHITRAVE, in architecture, is that part of the order of columns lying immediately upon the capital. It has its name from repreſenting the principal beam or portrait in any building; it is likewiſe called the reaſon-piece, or maſter-beam, in timber building; but in chimnies it is called the mantle-piece; and over the jambs of doors, and the lintels of windows, hyperthyron.

ARCHIVAULT, in architecture, the inner center of an arch, or a ligature adorned with moulding, running over the fronts of the arch ſtone, and bearing upon the impoſts. It has only one face in the Tuſcan order, two in the Doric and Ionic crowned, and in the Corinthian and Compoſite, the ſame moulding with the architrave.

ARCHIVE, or ARCHIVES, an apartment in which records, charters, and other papers of a ſtate or community are depoſited.

The word is formed from the Latin, *area*, a cheſt.

ARCHMARSHAL, the grand marſhal of the empire; a dignity belonging to the elector of Saxony.

ARCHON,

ARCHON, in antiquity, the chief magiſtrate of Athens, after the aboliſhing of monarchical government. It was alſo an appellation given to ſeveral officers, both civil and religious, under the Greek emperors.

The word is Greek, ἀρχων, and literally ſignifies a governor or commander.

ARCHONTICS, the name of a ſect of heretics, who were a branch of the Valentinians. They attributed the creation of the world to different angels; neglected baptiſm, and all the myſteries of faith; ſaid that women were the work of the devil; and denied the reſurrection of the body.

ARCHPRIOR, a name by which the maſter of the order of the knights-templars was ſometimes called.

ARCHTREASURER, the grand treaſurer of the German empire; a dignity belonging to the duke of Brunſwic, king of Great Britain. It is alſo claimed by the elector palatine.

ARCTIC, or ARTIC, in aſtronomy, an epithet applied to the north pole; likewiſe to a leſſer circle, parallel to the equator, at $23\frac{1}{2}$ diſtance from the north pole. See SPHERE, POLE, CIRCLE, &c.

ARCTIUM, burdock, in botany, a genus of plants which produces large heart-ſhaped leaves growing on foot ſtalks, that ariſe from the roots, which are large, biennial, and run perpendicular in the ground; the flower is compoſed of many uniform tubulated florets, containing five ſhort filaments with cylindrical antheræ; the germen is oblong, with a hairy top ſupporting a ſlender ſtyle, and becomes a ſingle pyramidical angular ſeed, crowned with down. Theſe plants grow wild in many parts of England; the leaves are uſed by ſome for burns and inflammatory tumors; the ſeeds are eſteemed extremely diuretic, and are reckoned effectual in carrying off by thoſe diſcharges, what is very much the occaſion of arthritic pains, when it is once depoſited upon the joints. The burdock is called lappa by Tournefort and others, alſo by ſome bardana; but Linnæus has altered it to arctium, ſo called originally by Dioſcorides.

ARCTOPHILAX, in aſtronomy, the name of a conſtellation, otherwiſe called Boötes. See BOÖTES.

ARCTOTIS, in botany, a genus of plants with radiated flowers, formerly called anemonoſpermos.

ARCTURUS, in aſtronomy, the name of a fixed ſtar, of the firſt magnitude, in the ſkirts of the conſtellation Boötes: for its declination, right aſcenſion, &c. See the conſtellation BOÖTES.

ARCTUS, in aſtronomy, the Greek name of *urſa major* and *minor*, northern conſtellations.

ARCUATION, in gardening, is the act of propagating trees, ſhrubs, &c. by laying down in the earth, and faſtening with pegs, the branches of a ſtool or mother plant, in order to their ſtriking root, and thereby becoming plants themſelves. In ſome ſorts it is neceſſary to cut a notch in the joint about half-way through, to facilitate their rooting; but others, whoſe parts are more inclinable to rooting, does not require it. If the main branches are ſo ſtubborn as not eaſily to bend, it may be proper to cut them half-way through, with a ſlit upwards, which will make them more pliable. Some ſorts require to be layed two years, before they get root, which by trying one or two may be known; they all ſhould have the earth drawn in a little ridge about the extremity of the layers, in order to retain the moiſture when watered in dry weather.

ARCUTIO, the name of a machine conſiſting of a board covered with hoops, and uſed by the nurſes of Florence, to prevent the child from being overlaid. Every nurſe is obliged to lay her child in an arcutio, under pain of excommunication.

ARDASSES, in commerce, the coarſeſt of all the ſilks brought from Perſia.

ARDEA, the heron, in natural hiſtory, a genus of long-beaked birds; diſtinguiſhed from all others by having the middle toe of each foot ſerrated, or jagged, with a ſeries of ſcales on its outer ſide.

ARDENT, ſomething hot, or as it were burning.

The word is formed from the Latin, *ardens*, which is derived from *ardeo*, to burn.

ARDENT *Fever*, a violent burning fever. See FEVER.

ARDENT *Spirits*, thoſe diſtilled from fermented vegetables; ſo called becauſe they eaſily take fire and burn.

ARDERS, among huſbandmen, implies the fallowings or plowings of grounds. See FALLOWING.

ARDO VENTRICULI, the cardialgia, or heart-burn. See CARDIALGIA.

AREA, in a general ſenſe, implies any plain ſurface whereon we walk, &c.

The word is Latin, and properly ſignifies a threſhing-floor.

AREA, in geometry, ſignifies the ſuperficial content of any figure whatſoever. To find the area or content of any figure, ſee for each under its reſpective name.

AREA, in aſtronomy, is deſcribed by the radius vector, or line joining the ſun and planet in its orbit, at different periods of its revolution; and theſe areas are always proportionable to the time in which they are deſcribed; thus (Plate X. *fig.* 1.) the area of the triangle A *n* S: area of the triangle *n* S P:: the line of the planet's deſcribing the arch A *n* of its orbit, to the time of deſcribing the arch *n* P of its orbit.

AREA,

Fig. 1. Argument of Latitude

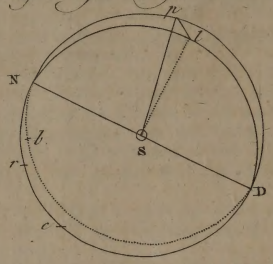


Fig. 2. Assay Oven

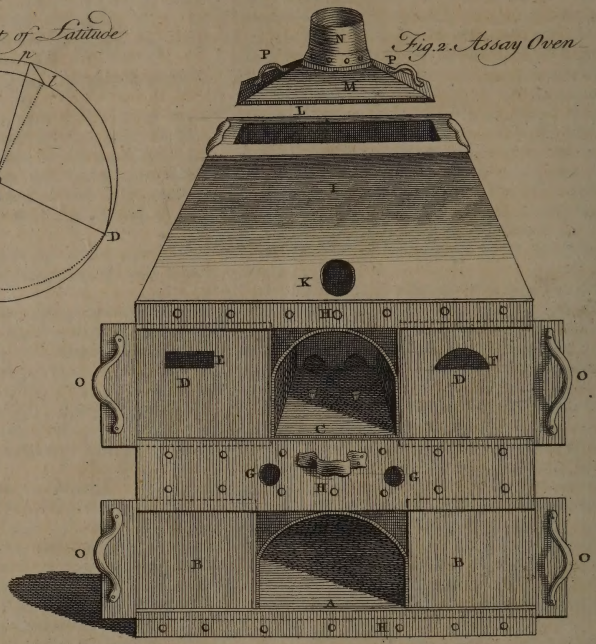
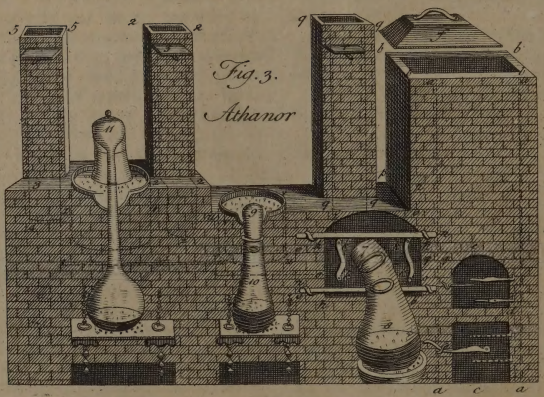


Fig. 3. Athanor



J. Hodge Sculp.

AREA, among phyſicians, the ſame with alopecia. See ALOPECIA.

ARECA, in botany, a ſpecies of the palm-tree growing in the Eaſt-Indies, producing male and female tripetalous flowers, with egg-ſhapped ſeeds. It is accounted by the natives of thoſe parts, as a ſtomachic and preſerver of the gums.

ARENA, ſand, in natural hiſtory. See SAND.

ARENA, in antiquity, the place where the gladiators, &c. fought; ſo called from its being always covered with ſand to conceal the blood ſpilt in the combat from the view of the people.

ARENATION, a kind of dry bath, where the patient ſits with his bare feet on hot ſand.

ARENARIA, in botany, a genus of decandrious plants, whoſe flowers are compoſed of a pentaphyllous empalement, with five ovated petals, and ten awl-ſhaped filaments, topped with roundiſh antheræ; the germen is egg-ſhapped, ſupporting three ſtyles; the capſulæ, which is unilocular and ovated, contains ſeveral reniform ſeeds.

AREOLA, among anatomiſts, the coloured circle ſurrounding the nipple of the breaſt.

AREOPAGUS, or ARÆOPAGUS, in antiquity, a ſovereign court at Athens, ſo famous for the juſtice and impartiality of its decrees, that the gods themſelves are ſaid to have ſubmitted their diſputes to its determination.

ARGEA, or ARGEI, in antiquity, thirty human figures made of ruſhes, and thrown annually by the prieſts or veſtals into the Tiber, on the day of the ides of May.

ARGEMONE, the prickly poppy, in botany, a plant which is common in moſt parts of the Weſt-Indies; the flower it produces is polyandrious, containing five roundiſh petals, which ſpread open; the capſule is quintangular and egg-ſhapped, and filled with a number of ſmall ſeeds. It is called by the Spaniards, *fico del inferno*, or devil's fig.

ARGENT, in heraldry, the white colour in the coats of gentlemen, knights, and baronets; the white in the arms of ſovereign princes being called luna; and that in the arms of the nobility, pearl.

This is expreſſed, in engraving, by the parts being left plain, without any ſtroke from the graver.

ARGENTARIA CRETA, in natural hiſtory, an earth, perfectly white and pure, found in Pruſſia, and greatly eſteemed for cleaning plate.

ARGENTINA, in natural hiſtory, the name of a fiſh found in ſeveral parts of the Mediterranean. It reſembles a pike, and has an oblong round body without ſcales. It is of a greeniſh aſh-colour above the lateral lines, but below them of a bright ſhining ſilver colour, eſpecially over the covers of the gills. The ſnout is oblong; the mouth of a moderate ſize, without teeth in the jaws, though there are ſix or eight crooked ones near the end of the tongue. The eyes are large, with a ſilver-coloured iris; and the brain may be ſeen through the ſkull. About the middle of the back is a fin, ſupported by ten rays. The tail is forked; but the principal mark that diſtinguiſhes it from all other fiſh, is the air bladder, which is conical at both ends, and outwardly looks as if covered with poliſhed ſhining leaf ſilver. This is made uſe of to counterfeit pearls. It is often brought to the fiſh-markets at Rome.

ARGENTINA, ſilver-weed or wild tanſy, in botany. See POTENTILLA.

ARGENTUM, ſilver, in natural hiſtory. See SILVER.

ARGETENAR, in aſtronomy, a ſtar of the fourth magnitude, on the curve of the river Eridanus. See ERIDANUS.

ARGILLA, clay. See CLAY.

ARGO, in antiquity, a ſhip or veſſel celebrated among the poets, as being that wherein the Argonauts made their expedition.

ARGO *Navis*, or the ſhip, in aſtronomy. See NAVIS.

ARGOL, red tartar. See TARTAR.

ARGONAUTS, in antiquity, a company of illuſtrious Greeks, who embarked with Jaſon, in the ſhip Argo, on an expedition to Colchis, in order to acquire the golden fleece.

ARGUMENT is defined by Cicero to be *ratio probabilis, et idonea ad faciendam fidem:* "A "probable and apt reaſon to gain belief." It is more accurately defined by the logicians, who call it a mean, or middle, which by its connection with the two extremes, connects the extremes with each other. In other words, it is an inference drawn from premiſes, the truth of which is indiſputable, or at leaſt highly probable.

Arguments are diſtinguiſhed, in relation to the ſource from which they are drawn, into arguments taken from reaſon, and arguments taken from authority; in relation to their form, they are diſtinguiſhed both by rhetoricians and logicians into ſyllogiſms, enthymenes, inductions, or ſorites, and dilemmas. See SYLLOGISM, ENTHYMEME, INDUCTION, &c.

An argument in form is a ſyllogiſm, framed according to the rules of logic, to which this kind of argumentation is nearly allied. All rhetoricians ſince Ariſtotle ſay, that the enthymeme is the argument in rhetoric; becauſe it is the form of reaſoning moſt familiar to orators. Rhetoric, according to their definition, being nothing but the art of finding in every ſubject arguments proper to perſuade, they diſtinguiſh them into two kinds, in relation to the ſources from which they are furniſhed; viz. intrinſecal, or artificial arguments, and extrinſecal, or natural ones. Intrinſecal, or artificial arguments, called by the Greeks, ἐντεχνα, and by the

Latins, *inſita*, are thoſe which depend on the ability of the orator, which he either draws from himſelf, or from his audience, or from the ſubject on which he is treating. The orator ſometimes perſuades from the weight of his own perſon or manners, when his diſcourſe ſtrikes his audience with a lively idea of his virtue and probity; becauſe we voluntarily give credit to the words of ſuch a man, eſpecially in points that are doubtful and problematical: it was for this reaſon, that Cato regarded probity as the great baſis of all eloquence: *Orator vir bonus, dicendi peritus.* The arguments that are drawn from the part of the audience, have for their object ſome paſſion or other, that may lead and biaſs the judgment either to this or that ſide. It is by this, that the orator is enabled to exerciſe an abſolute empire over thoſe that hear him, and determine their judgement juſt as he pleaſes. But to do it effectually is a great and difficult art, as it requires a thorough and deep knowledge of manners and paſſions, and a perfect acquaintance with all the various ſprings of the human mind.

The arguments that are drawn from the ſubject itſelf, conſiſt in laying it open to the bottom, and conſidering its nature, circumſtances, effects, conſequences, conformity, or diſagreement with others, &c.

Extrinſecal or natural arguments are thoſe which do not depend at all upon the orator, but are found as it were ready made to his hands; ſuch, for inſtance, are arreſts, judgements, laws, written demonſtrations, public regiſters, depoſitions of witneſſes, &c. which ſupply him with authorities, from which he draws his conſequences.

ARGUMENT, in aſtronomy, is a known arch, by the help of which we find others that are unknown.

Thus if the plane of the planet's orbit be ſuppoſed infinitely extended to the heavens, the orbit then reſpectively to the ſun S, (Plate XIII. *fig.* 1.) will be a great circle, as N *p* D *b*, of the celeſtial ſphere, inclined to the celeſtial ecliptic N *l* D *c*; the interſections or nodes of theſe two circles will be in N and D; and if the point *b*, anſwering to the beginning of aries, be marked on the orbit N *p* D *b*, the arc D *b* is then called the longitude of the aſcending node: from the point *p*, draw *p l* perpendicular to the ecliptic, then is the arc *p l* the planet's latitude, and D *p* the argument of the planet's latitude, which is the planet's diſtance from the aſcending node.

ARGUMENT alſo implies the abridgement or heads of a book, chapter, poem, &c.

ARGUMENTATION, the act of arguing; and the manner of framing arguments.

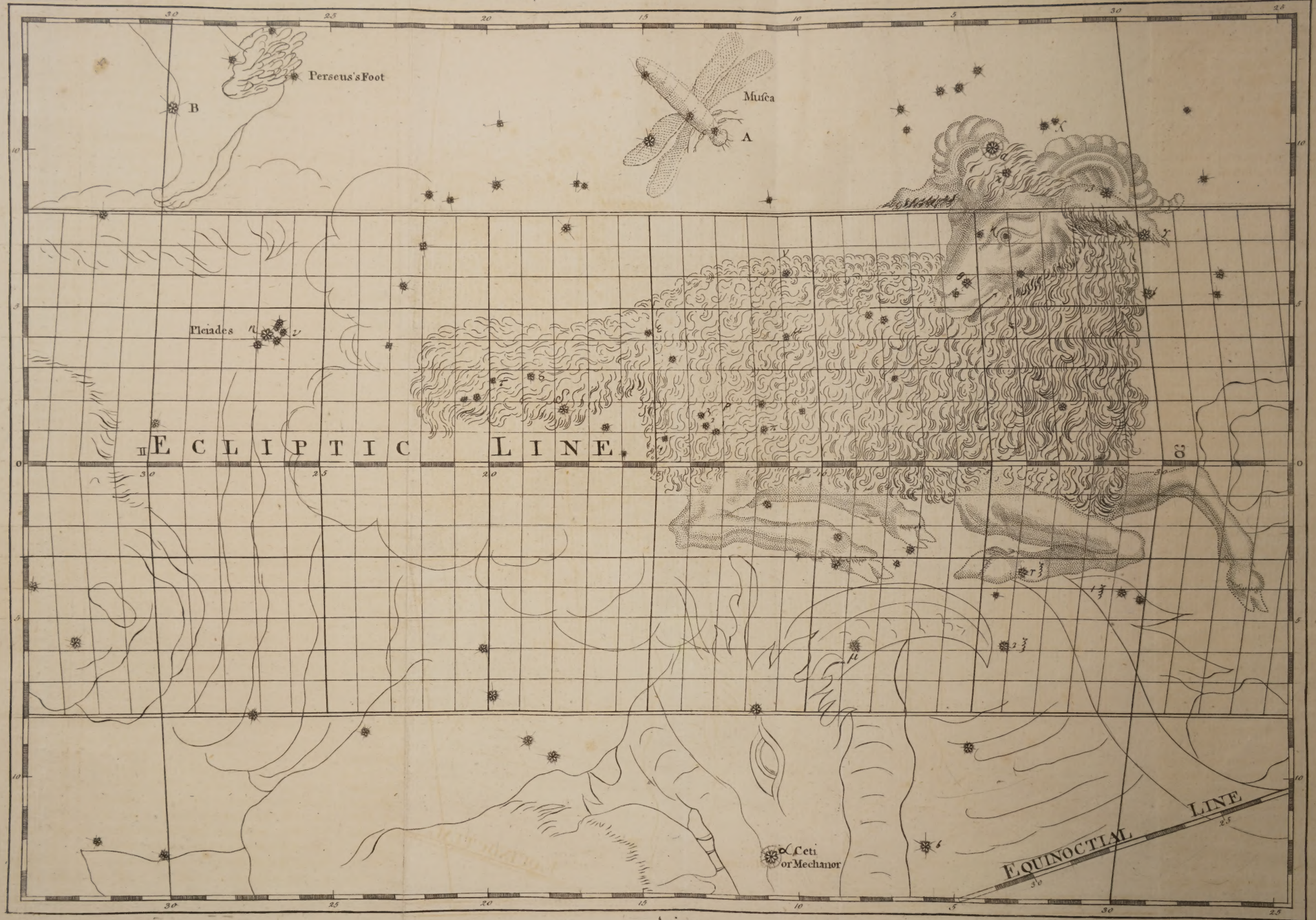
ARGUS, in natural hiſtory, the name of an uncommon ſerpent found in Guinea; and ſo called from its being covered with ſpots from the head to the tail, reſembling eyes. On the back there is a double row of them, which are the largeſt, and the ground colour of the ſcales is a bright cheſnut, except on the back between the eyes, where it is of a dark brown.

ARGUS is alſo the name of a very curious ſhell, about three inches long, two in diameter, and ſomewhat leſs in height. The mouth is wide, and the lips are continued at each extremity in the form of a broad ſhort beak, each way. The general colour is yelloviſh, only there are three brown bands of a conſiderable breadth running over it; and the whole ſurface is adorned with a multitude of round ſpots, like eyes, from whence it has its name. It is brought from Africa and the Eaſt Indies.

ARIA *Theophraſti*. See CRATÆGUS.

ARIANS, in eccleſiaſtical hiſtory, a ſect of heretics, who followed the opinions of Arius, a preſbyter of Alexandria, in the time of the patriarch Alexander. He broached his hereſy in the beginning of the fourth century.

ARIANISM, the doctrines of Arius and his followers. It is a remark not unworthy obſervation, that the greateſt number of thoſe who have diſſented from the received opinions of the church, have done it through the diſappointments they have met with in the earlier part of life, and have afterwards been confirmed in their errors, by that violent ſpirit of oppoſition which is ſure to perſecute them. We ſhall be convinced of the truth of this, if we attend a little to the conduct of Arius, when he firſt publiſhed his tenets to the world. He was a ſound ſcholar, and a ſubtle diſputant; as apt in logic, as accompliſhed in the belles lettres. Under the appearance of extraordinary virtue and piety, he had the art of concealing his vanity and ambition. From being a deacon, he was raiſed by Achillas, biſhop of Alexandria, to the prieſthood. At the death of this prelate, which happened in the year 312, Arius expected to have been elected into his room; and was chagrined and diſappointed at Alexander's being choſen. He was determined to be revenged on his rival; and accordingly, not only preached againſt him, but publiſhed a book, written expreſsly againſt Alexander, wherein he maintained, "That THE WORD was not equal "to the Father, and that it had not exiſted from "all eternity; but had been created out of no-"thing, and of courſe was to be ranked amongſt "the number of created beings." This was the firſt ſource and origin of that doctrine, which was called afterwards Arianiſm; and it aroſe, as we have already ſeen, from chagrin and diſappointment. Alexander proceeded againſt his antagoniſt with all the rancour and zeal of a furious bigot; what he wanted in argument he made up in railing, and at laſt advanced ſo far as to excommunicate and anathematize him. It muſt be owned, indeed,



Aries

J. Lodge Sculp

indeed, that he did this very *canonically*, if not charitably; for he called together near an hundred biſhops, amongſt whom Arius boldly profeſſed and defended his doctrines. Immediately all the thunder of the church was launched againſt the poor culprit and his followers; he was called unanimouſly the Man of Sin, and was *very piouſly* conſigned over to eternal perdition. It was expected by all the orthodox, that this powerful argument, which was ſo full of reaſon and religion, would have ſilenced Arius: but it had a direct contrary effect, for like the oak mentioned by Horace,

. . . . . *ab ipſo*
Ducit opes animumque ferro;

he gained ſtrength and ſpirits, by being hacked and hewed with the ſword of perſecution. His doctrines ſpread like wild-fire throughout Egypt, Lybia, and Paleſtine; converts came over to him daily, and that very oppoſition *was for his health, which was intended to him an occaſion of falling*. Things now began to wear a very ſerious aſpect; when Conſtantine the Great convened the General Council of Nice, in the year 325. Before this auguſt aſſembly Arius preſented himſelf; but to very little purpoſe for either party, as he was determined to defend his tenets, and the biſhops who were met together would not liſten to him, but while he was ſpeaking thruſt their fingers into their ears. A ſecond anathema was thundered out againſt him, and he was condemned to baniſhment; where he continued three years, and was then recalled. He preſented at his return a confeſſion of his faith to Conſtantine, which was drawn up in ſuch a very artful manner, that it comprized both the Catholic doctrine, and that of his own ſect. Arius afterwards went to Alexandria, of which ſee Athanaſius was then biſhop, but could not continue there, as the people refuſed to communicate along with him. He died of a fainting fit, at Conſtantinople, in the year 336: his death has been regarded by ſome as a judgement, becauſe Alexander had often prayed to God to take him out of the world, or to hinder his hereſy from ſpreading. His being removed out of the world did not ſeem to anſwer any great end, and therefore we will ſuppoſe it to be natural; for he left his doctrines behind him, which from that day to this, have had a conſiderable number of followers.

The particular tenets which were held by Arius are, That THE WORD, or the Son, did not exiſt from all eternity, but was created in time; that he is inferior to the Father, and of a different eſſence; that Chriſt had nothing of human nature but merely the fleſh, in which was THE WORD, that operated in him, as the ſoul in us; that the Holy Ghoſt was of the order of created beings. Theſe tenets made a very conſiderable progreſs in the Eaſtern churches, and were advanced in the Weſt by the followers of Servetus, who in the year 1531, publiſhed a treatiſe againſt the myſtery of the Trinity. See SERVETISTS.

They were adopted likewiſe with very little difference by Fauſtus Socinus, a gentleman of Sienna, about the year 1548, from whom ſprang the ſect of the Socinians. See SOCINIANS.

Theſe doctrines are all of them confronted in the creed that is called Athanaſian; not from its having been compoſed by Athanaſius, for it is of later date; but becauſe it contains thoſe tenets which were ſuppoſed to be held by Athanaſius, who was a warm ſtickler againſt Arius. See ATHANASIAN.

ARIDED, in aſtonomy, a fixed ſtar of the ſecond magnitude, in the ſwan's tail. See the conſtellation CYGNUS.

ARIDAS, a kind of taffety manufactured in the Eaſt Indies from a ſhining thread drawn from certain plants; and hence they are ſtiled aridas, or herbs.

ARIES, in aſtronomy, a conſtellation in the heavens repreſented by a ram, and which is the firſt ſign of the zodiac. The ſun enters this ſign the twenty-firſt of March, at a time when the fields and hills are more numerouſly overſpread with flocks than at any other ſeaſon, by the new increaſe of lambs; therefore it is natural to think, that the ancient aſtronomers obſerving the ſun to enter this ſign at ſo profitable a time, thought fit to ſignalize it by the principal of the flock, aries, or the ram.

The fabulous ſtories of the poets concerning aries are as follow: Athamas, king of Thebes, had by his wife Nephele, a ſon named Phrixus, and a daughter named Helle. He afterwards married again Ino, who fell deſperately in love with her ſon-in-law Phrixus; but finding herſelf ſlighted by him, ſhe perſuaded Athamas that the dearth which then happened, could not be remedied but by ſacrificing Phrixus and Helle: but Nephele gave them a golden ram, which ſhe had received of Mercury. On this ram they fled through the air from Thebes, and in their flight Helle fell off into the ſea, which from thence was called Helleſpontus; but Phrixus arrived at Colchis, where he was kindly received by Ela the king, who ſacrificed the ram to Jupiter, and hung up the golden fleece in the grove of Mars. There it was kept by bulls with brazen feet breathing fire, and alſo by a great dragon. The ram was afterwards taken up into heaven for his ſervices, and made a conſtellation.

Others will have this ram to be that which led Bacchus to a ſpring of water, when he had like to have periſhed through thirſt in the deſart of Lybia. Novidius will have this to be the ram which Abraham offered up inſtead of his ſon Iſaac.

For the places of the ſtars in this conſtellation, ſee the following Catalogue. See alſo Plate XIV.

Order.	Magnit.	Name.	Bayer Let.	Right Aſcenſion	Diſtance from Nor. Pole.	Var. in Right Aſcen.	Var. in Declination.
				° ′ ″	° ′ ″	″	″
1	6			21.42.34	68.55.30	48. 7	18.50
2	6			22.22. 8	70. 3.44	48. 7	18.49
3	6			23.22.22	73.49.21	48. 7	18.42
4	6			23.47.20	74.15.25	48. 7	18.40
5	4		γ	25.14.17	71.50.31	49. 0	18. 2
6	3		β	25.29.40	70.19.29	49.25	18.10
7				25.36.57	67.36.40	48.75	18. 0
8	6		i	26.12.24	73.18.51	48. 8	18. 0
9	5		λ	26.17.25	67.32. 0	49.48	18.50
10	7			27.30.47	65.14.17	50. 5	18.40
11	6			28.17.49	65.27.27	50. 5	18. 1
12	5		κ	28.17.57	68.30.16	49.40	17. 8
13	2	Lucida ♈	α	28.33.54	67.38. 5	50. 6	17.60
14	6			28.55.47	65.12.25	50. 0	17.50
15	6			29.19.35	71.30. 0	49. 2	17.45
16	8			29.23. 8	65.12. 3	50. 0	17.40
17	6		η	29.50. 1	70.56. 7	49.40	17.32
18	7			29.56. 4	71.12.56	49.40	17.21
19	7			29.57.49	75.51.59	48.70	17.12
20	6			30.30.10	65.20.53	50. 6	17. 6
21	7			30.30.19	66. 5. 8	50. 6	17.03
22	6	1ma ad	θ	31.20. 2	71.23. 9	49 40	17.02
23	7	2da ad	θ	31.26.58	71.25.21	49.40	17 00
24	6		ξ	33. 7.18	80.26.12	48. 0	16. 8
25	7			33.38.30	80.52.47	48. 0	16.71
26	7			34.17.18	71.13.32	48. 0	16.64
27	7			34.22.54	73.22.28	48. 0	16.56
28	6			34.30.40	71.11.55	48. 0	16.48
29	7			34.55.44	76. 2.58	48. 0	16.34
30	7			35.47. 1	66.24.21	50. 6	16.28
31	6			36. 1.11	78.33.18	48. 5	16.20
32	6		γ	36.17.24	69. 5.43	50. 4	16.14
33	5			36.39. 9	64.59. 8	50. 9	16.10
34	6		μ	37. 2.35	71. 1.25	51. 4	16.05
35	4			37.18.37	63.19.27	51. 4	16.02
36	7			37.43.47	73.16.11	49.40	16. 0
37	6		ο	37.48.52	75.43.12	49 40	15.94
38	7			37.57.19	78.34.49	48.70	15.85
39	4			38.22.45	61.45.43	51. 8	15.73
40	6			38.46.42	72 44.10	50. 2	15.67
41	3			39. 6.50	63.42.24	52. 4	15. 6
42	6		π	39. 8.37	73.32.13	50. 2	15.53
43	6		σ	39.33. 9	75 55.40	50. 2	15.50
44	6	1ma ad	ρ	40.21.43	73 15.20	50. 2	15.43
45	7	2da ad	ρ	40.34.37	72.39.35	50. 2	15.30
46	7	3tia ad	ρ	40.51.52	72.54.28	50. 2	15. 2
47	7			41. 4.43	70 18.43	50. 6	15.25
48	5		ε	41.31. 7	69.35.29	51. 1	15. 1
49	7			41.57.10	64.30.48	51. 4	15. 0
50	7			42. 0.11	73.58.19	50. 5	14. 9
51	7			42. 3.18	64.20.48	51. 8	14.81
52	6			42.50.47	65.42.20	51. 7	14.73
53	7			43.28.52	73. 4. 0	50. 6	14.65
54	7			43.40.49	72. 9. 7	50. 6	14.50
55	7			43.48. 2	61.51.44	51.40	14.42
56	7			44.29.22	63.41.48	51.40	14.36
57	4		♑	44.37. 5	71. 9.37	50. 9	14.31
58	5		ζ	45.25.16	69.49.39	51. 4	14.11
59	7			46.24.43	63.48.13	51. 7	14. 0
60	7			46.33.16	65.13.16	51. 7	13. 9
61	7	1ma ad	T	46.50.40	69 44.51	51. 6	13.82
62	6			46.57.24	63.16.46	51. 6	13.74
63	6	2da ad	T	47.22.53	70. 6.44	51. 5	13.66
64	6			47.31.56	66. 8.36	51. 4	13.60
65	7			47.38.10	70. 4.41	51. 6	13.51
66	7			48.36.17	68. 2.33	51. 5	13.45

ARIES, the battering ram. See BATTERING RAM.

ARISARIUM, in botany. See ARUM.

ARISH, a Perſian long meaſure, containing about 3197 Engliſh feet.

ARISTA, among botaniſts, a long needle-like beard, which ſtands out from the huſk of a grain of corn, graſs, &c. It is alſo called awn.

ARISTOCRACY, a form of government where the ſupreme power is lodged in the principal perſons of the ſtate, either on account of their nobility, their capacity, or their probity.

The word is Greek, and compounded of ἀριστος, principal, and κρατεω, to command.

ARISTOLOCHIA, *Birthwort*, in botany, a genus of gynandrious plants; the flower conſiſts of an irregular ſingle petal without any filaments, but contains ſix antheræ, which join the under part of the ſtigma; the fruit is a large hexangular capſule of ſix cells, containing a number of depreſſed ſeeds: there are two ſorts of birthwort, whoſe roots are imported for medicinal uſes from France, Spain, and Italy; one ſort with long roots, and the other with roundiſh roots, in ſhape and colour like the common cyclamen roots. The former is of a ſubacrid aromatic taſte, and both ſorts by all accounted a great cleanſer of the womb, both as a provoker of the menſtrual diſcharges, and a forwarder of delivery: it is ſaid to be ſo powerful as to cauſe abortion, if given to a woman with child; and many of the old writers on phyſic have aſſerted, that if a pregnant woman ſtepped over one of theſe roots, it would certainly cauſe a miſcarriage, and the roots, properly applied, would haſten delivery.—To birthwort are aſcribed ſome alexipharmic qualities, and it is reckoned detergent externally, and ſuppurative; for which reaſon it hath been uſed in ſtyptic plaſters.—One of the ſpecies of ariſtolochia is called the Virginia ſnake-root. See the article SNAKE-ROOT.

ARISTOTELIAN, in a general ſenſe, ſignifies any thing that belongs to Ariſtotle.

ARISTOTELIAN *Philosophy*, the philosophy of Aristotle, called also the peripatetic philosophy, from a custom which Aristotle had to philosophize while he was walking. Notwithstanding Plato was Aristotle's master, the peripatetic philosophy was set up in opposition to the academic, of which Plato was the inventor. Aristotle was chagrined at Zenocrates succeeding Speusippus as head of the academic sect; and thro' a spirit of emulation composed his system of laws and politics, to destroy the credit of what Plato had before written upon that subject.

If we consider the busy life of Aristotle, who was tutor to Alexander the Great, and besides the time which he spent in travelling, was engaged in endless disputes in the Lyceum; we shall be astonished how he could find leisure to compose the hundredth part of those books he is said to have done, amounting to above four thousand, of which few more than twenty are at present extant. The truth is, he was a man of an universal and comprehensive genius, with an insatiable thirst for knowledge, that roused his industry, and made him read over all the books of the ancients. At the head of those works which he has left us, are his treatise of Rhetoric and Poetry, which were composed in all probability to form the taste of that illustrious prince whose education had been committed to his care. They are full of excellent remarks and wise instructions in these two branches of science, and are undoubtedly master-pieces: no man has penetrated farther into the human heart than he has done; nor laid more open those secret and invisible springs that move it. Whatever has been written since on these two subjects has been borrowed from him; and one may venture to affirm that these two works do more honour to his memory, than all the others put together. His Morals are dry and barren, and present us with nothing but general views and metaphysical propositions; which are more adapted to set off the wit and burden the memory, than touch the heart and rectify the will. Such is in general the spirit that prevails in the ethics of this philosopher: we shall present the reader with a few of his precepts, and the turn that he gives them:

First, He says, that the happiness of man does not consist either in pleasures, or riches, or honours, or power, or nobility, or in speculations of philosophy; but in—what?—why the ΕΝΤΕΛΕΧΕΙΑ; a word of so dark and doubtful a signification that Hermolaus Barbarus is said to have consulted the devil about it; after which, in his Paraphrase on Themistius, whether from the devil or himself we will not pretend to say, he renders it by *perfectihabia*, which is not a whit the clearer. We imagine that Aristotle meant habitudes of the soul, which render it more or less perfect.

Secondly, "Virtue is full of charms and attractions." This he had from his master Plato; but he improves upon it, and says, that "a life where the virtues are linked together one with another, must needs be perfectly happy."

Thirdly, Tho' Virtue is sufficient of herself, yet it cannot be denied, that she finds a powerful support in riches, honours, nobleness of blood, beauty, and strength of body; all which contribute to make her take a loftier flight, and, of course, advance the happiness of mankind.

Fourthly, All virtue is placed in the middle, between the two extremes of excess and defect: thus, courage is the mean between fear and rashness; magnificence, betwixt luxury and sordidness, &c. from which one may conclude, that the number of vices is double that of the virtues, because every virtue has a vice on each side of it.

This is sufficient for a specimen of Aristotle's Ethics, in which he has not succeeded so well as in his Logic. He has there laid open the principal sources of the art of reasoning; he has pierced into the inexhaustible fund of human thoughts; he has distinguished ideas; has shewn their connection with each other, and pursued them thro' all their deviations and seeming contrarieties, till at last he has brought them to a fixed and determined point. Yet his method, so much approved by philosophers formerly, is not without defect; sometimes he is too diffuse and prolix, which discourages one from going on with him: his book of Categories, and that of Interpretation may be contracted to a few pages; the idea is often lost in a crowd of words: at other times he is obscure and embarrassed; we are obliged to divine, and can guess only at his meaning. We shall give no specimen here of his Logic, as we shall be obliged, in the course of this work, to explain it under the different words that he has made use of to distinguish his syllogisms, &c.

Let us now a little consider his Physics, or natural philosophy; in which we shall generally follow the celebrated Lewis Visis, as he has disposed it in a very methodical manner. He begins with his eight books of natural principles, which seem rather a compilation of different memoirs, than a work formed upon any one regular plan. These books treat in general of *body extended*, which is the object of physics; and in particular, of the principles, and every thing that has a connexion with them; as motion, space, time, &c. Nothing can be more confused than this part of his work: the definitions render those things which they were intended to explain, less intelligible than they were before. Aristotle begins with blaming the philosophers who preceded him, some for admitting too many principles, others for admitting only one. With regard to himself, he has established three, viz. *Matter*, *Form*, and *Privation*. Matter, according to him, is the general subject on which nature operates; it has existed from eternity, and is itself eternal; it is the parent of all things that long

for motion, and desire that form should unite them to it. It is difficult to say what Aristotle understood by this first matter, which he defines, "that which has neither quality nor quantity, nor any mode or accident by which its essence may be determined." It seems to have been with him a mere abstract idea, or imaginary being that had no real existence of its own, tho' he affirms that it was the first principle of existence in every thing besides.

Having established these three principles, he passes on to explain the causes, which he treats of distinctly enough, but almost without mentioning the first cause, which is God: and this has given occasion to some to accuse Aristotle of atheism, as if he was ignorant of, or did not believe in the existence of a Deity. But this appears to be a mistake; for he asserts that there is ONE effective principle, or plenary cause, by and through which every thing exists; that it informs the whole universe, and renders those beings in which it resides capable of motion or rest in themselves. He calls indeed this first great cause Nature; but he could mean nothing by this term but the Deity, or that ONE SUPREME, in and thro' whom *we live and move, and have our being*.

He then proceeds to treat of motion and rest; finite and infinite; of the vacuum and atoms; of space and time; in all which he makes no confusion; one proposition leads naturally to another, and tho' he proceeds always with the greatest rapidity, yet still the connection is preserved in the strongest and plainest manner imaginable.

After having explained what he means by *Matter* and *Form*, he begins to treat of the third principle, which he calls *Privation*. He contradicts the prevailing opinions that nothing absolutely perished, but something was again produced from it; that all the changes which happen in bodies, were only another arrangement, or different distribution of the parts of matter which compose these same bodies; and that increase and diminution, division and reunion, separation and mixture, would account for all the changes that happen in the universe. He rejects these notions, and establishes the doctrine of generation and corruption, affirming that new beings are continually produced out of the womb of Nature, which perish in their turns; and that from this privation, other beings again exist. This part of Aristotle's system is very perplexed and chimerical, and has led the schoolmen into monstrous absurdities, who have multiplied a number of nonsensical terms, such as *forma substantialis*, *modilitas*, &c. which raise no ideas, except those of wrangling and disputation.

Aristotle does not content himself with laying down a general system of natural philosophy, but descends to particulars, and treats of wind, rain, hail, dew, &c. besides which he has given us a history of animals, which has been highly approved by Mr. Buffon, who himself has treated largely on this subject.

It is no wonder, if we consider every thing, that there should be many false and absurd opinions maintained by this universal philosopher. He asserts that the universe is not equally under the immediate government of God, but that the celestial bodies only are worthy of his care and attention: as to all sublunary things, he thinks them below his notice, and, to use the words of Prior, imagines the Deity

> Has fairly left us, human elves,
> To cut and shuffle for ourselves,
> To stand or walk, to rise or tumble,
> As matter and as motion jumble.

Diogenes Laertius tells us, that it was the opinion of Aristotle, that the heavenly bodies only were governed by the Deity, and that the earth and all its inhabitants were regulated and influenced by a kind of sympathy with them. He saw that all sublunary things were subject to changes and vicissitudes, to disasters and evils; which made him conclude that they could not possibly be under the immediate care and providence of an all-wise and gracious Being. Aristotle denied the immortality of the soul, which he looked upon as a particle of the Divinity, which was lent to man on his first appearance upon this theatre, and was to be resumed again into the Divinity, when he made his exit. The false notions which he had framed to himself of motion, led him to believe that the world was eternal: Motion, says he must have been eternal, consequently the world, wherein it exists, must have been so too.

Before we conclude this article, it may not be amiss to present our readers with an ingenious parallel, drawn by father Rapin, between Aristotle and Plato. The qualifications of the mind were extraordinary in both one and the other; they had each of them an elevated genius, capable of the highest and noblest contemplations. The wit of Plato was more elegant and polished, and that of Aristotle more grand and profound. Plato's imagination was lively, copious, fruitful in invention, in ideas, in expression, in figures; he could give a thousand different turns, and place the same subject in a thousand different lights, all striking and agreeable: but still this was often nothing but imagination. Aristotle is harsh and dry, but what he says carries with it the force of reason: his diction, tho' pure, has in it I know not what of austerity; and his natural or affected obscurities disgust and fatigue the reader. In Plato there is a delicacy of thought and expression not to be found in Aristotle, who is natural, simple and even, but at the same time close and nervous. The stile of Plato is sublime and elevat-

ed, but loose and diffuse; he says always more than he should; Aristotle does not say enough, but leaves to the reader to supply what is wanting: the one surprizes and dazzles with his sublimity and brightness, the other improves and instructs by his judgment and solidity. Plato seems to have studied chiefly how he should speak, Aristotle how he should think; the latter has given us strength and substance, and the former grace and colour.

ARISTOTELIAN *Wheel, rota Aristotelica.* See ROTA.

ARITHMETIC is the art or science of computation, hath for its subject number, and teaches us to give proper answers to such who demand how many?

Number must have been made use of ever since our first parents had occasion to communicate their ideas to one another, of *so many* or *so much*; and as to the origin of arithmetic, tho' history neither fixes the time nor author, yet in all probability it took its rise with the introduction of commerce, and is therefore of Tyrian invention.

Josephus tells us, the art was carried by Abraham into Egypt; from thence it hath been supposed to be transmitted to the Greeks, who handed it with great improvements to the Romans, and from them it came to us; and as learning advanced in Europe, so likewise did the knowledge of the science of arithmetic, which gradually received great improvements, and is far superior to the ancient, which chiefly consisted in the various division of numbers, as appears from a treatise writ by Nichomachus in the third century, and one of Boethius, which are still extant. But what rendered their operations abstruse and tedious, was their imperfection in notation; for not having any character to supply the place of our cypher, (which were received from the Arabians) their series only extended to nine, while the present method changes the value of numbers in a decuple progression.—Modern arithmetic is divided into different kinds, viz. theoretical, practical, instrumental, numerous, specious, logarithmetical, decimal, dignæmical, tetractical, duodecimal, sexagesimal, &c.

Theoretical ARITHMETIC is the knowledge of the properties and proportions that numbers bear to each other considered abstractedly, with the reasons and demonstrations of the several rules in common arithmetic. The seventh, eighth, and ninth books of Euclid's Elements, where he has delivered the doctrine of proportion, and that of prime numbers, is the oldest extant of this kind; however, since Euclid we have had many treatises on theoretical arithmetic by different authors, as Barlaam the monk, Frater Lucas. de Burgo, &c.

Practical ARITHMETIC is that which shews the method of working by numbers, so as may be most useful and expeditious for business. The first entire treatise we have of this kind was given by Nicholas Tartaglia, a Venetian, in the year 1556, consisting of two books: the first contained the application of *Arithmetic* to civil uses, the latter the grounds of algebra. Stifelius gave some few particulars concerning the application of irrationals in 1544, which are no where else to be found. However, since their time, almost an infinite number of authors have appeared to the publick, viz. Metius, Ramus, Clavius, Buckley, Diggs, Record, Cocker, Wingate, Leybourn, Ward, Malcolm, Weston, West, Gordon, Fenning, Dilworth, Fisher, &c.

Instrumental ARITHMETIC is that which is performed with great ease and expedition by means of scales, rules, sectors, Napier's bones, &c. for the method of performing which, see under each particular article, SCALE, RULE, &c.

Numerous ARITHMETIC is that which gives the calculus of numbers or indeterminate quantities, and is performed by the common numeral, or Arabic characters.

Specious ARITHMETIC. See ALGEBRA.

Logarithmetical ARITHMETIC is that which is performed by tables of logarithms; which are artificial numbers in arithmetical progression, which being fitted thereto express the ratios of natural numbers in geometrical progression. See LOGARITHMS.

Decimal ARITHMETIC is a very compendious method of performing many calculations in practical arithmetic, especially in interest, annuities, &c. See DECIMAL FRACTIONS.

Dyadic, or *Bynary* ARITHMETIC is that wherein only two figures, viz. unity, or 1, and 0, are used. See BINARY.

Tetractyc ARITHMETIC is that only wherein 1, 2, 3, and 0, are used.

Duodecimal ARITHMETIC. See *Duodecimal* FRACTIONS.

Sexagesimal ARITHMETIC. See *Sexagesimal* FRACTIONS.

Political ARITHMETIC is the application of arithmetic to political subjects. See POLITICAL *Arithmetic.*

ARITHMETIC *of Infinites* is the method of summing up a series of numbers consisting of infinite terms. See SERIES.

ARITHMETIC *of Irrationals and Surds*, &c. See SURDS, &c.

Universal ARITHMETIC, a name given by Sir Isaac Newton to algebra, or the calculation of quantities in general. Nor did that great man, whose elevated genius and profound penetration seem to have traced all the sciences to their true metaphysical principles, give it this title without sufficient reason.

Common arithmetic has two kinds of principles; the first are general rules, independent of the characters made use of to express numbers; the second are rules which depend upon these characters, and are

are properly called rules of arithmetic. The former contain only the general properties of proportions, and take place universally, be these proportions stated how they will.

Hence it follows, that by noting numbers by general expressions, tho' they do not denote one number more than another, we may form certain rules relative to operations, which may be performed by numbers so expressed. These rules shew the result of one or more operations performed by numbers expressed in a general manner, and in the most simple method; and this result is properly nothing more than an arithmetical operation, expressed in characters, which will vary according to the different arithmetical values we assign the quantities substituted for numbers.

In order to set this idea of algebra in a clearer light, it may not be amiss to mention, in a cursory manner, the four common rules of arithmetic. Addition consists in the adding any numbers proposed into one total, without any other operation. If, for example, it were required to add two dissimilar quantities together, as a and b, we set them down simply $a+b$, the result of which is nothing more than an indication, that if a represents a certain number, and b another, these numbers must be added together. The expression $a+b$ is therefore nothing more than an indication of an arithmetical addition, the sum of which will be different, according to the different arithmetical values assigned to a and b. Suppose it were required to add $5a$ to $3a$, we may write $5a+3a$; but it is plain that this may be expressed in a more simple manner; viz. $8a$; and consequently the arithmetical operation should be expressed in that manner.

Hence it follows, that addition in algebra expresses the sum or aggregate of several numbers, generally in the most simple manner, and saves the arithmetician as much labour as possible.

In subtraction, the thing is the same; for if it be required to subtract b from a, we write $a-b$; because it is impossible to express this operation in a more simple manner: but should it be required to subtract $3a$ from $5a$, it would be improper to write $5a-3a$; because, if a had any numerical value, it would occasion the trouble of several arithmetical operations; but simply $2a$, which is more convenient in calculation.

The same thing is true in multiplication and division. If we would multiply $a+b$, by $c+d$, we might write indifferently $a+b\times c+d$, or $ac+bc+ad+bd$; though the first method seems the more proper, because it requires fewer arithmetical operations: in the former there are only two additions and one multiplication necessary; in the latter, three additions and four multiplications. But if it should be required to multiply $5a$ by $3a$, we should write $15a$, and not $5a\times 3a$; because the first has only two arithmetical operations, and the second three. In the same manner, to multiply $a+b$ by $a-b$, we should write $aa-bb$; because this result would be more commodious than $aa+ab-ab-bb$, and at the same time furnishes a useful theorem, namely, that the product resulting from the sum of two numbers, multiplied by the difference of the same numbers, is equal to the difference of their squares.

In division, instead of writing $\frac{20ab}{5b}$, we should set down simply $4a$; but to express the division of ab by cd, we must write $\frac{ab}{cd}$; because a more simple expression cannot be found.

Hence it is evident that Sir Isaac Newton was in the right to call algebra universal arithmetic; because it exhibits all the general and common rules of every kind of arithmetic, in a more clear, concise, and simple method.

But it may be asked, why we should have recourse to perplexity? In all arithmetical questions the numbers are expressed; of what use therefore can it be to give them a literal expression?

The answer is very easy: There are questions far more complicated; and in the solution of these we are obliged to form combinations, of which the number or numbers sought must form a part. We must therefore be possessed of an art, whereby we may represent these combinations without knowing the number sought; and consequently express these numbers by characters not numerical: because it would be very improper and inconvenient to express an unknown number by a numerical character, which we had no reason to expect would be its real value.

ARITHMETICAL, something belonging to, or performed by arithmetic.

ARITHMETICAL *Complement of a Logarithm*, is what any logarithm wants of 10,0000000, as 7,520335 is the arithmetical complement of 2,4789665, where each figure is subtracted from 9, except the last which is subtracted from 10.

ARITHMETICAL { *Mean.* *Progression.* *Proportion.* *Ratio.* } See { MEAN. PROGRESSION. PROPORTION. RATIO.

ARITHMOMANCY, a species of divination performed by numbers.

The word is Greek, ἀριθμομαντεια, and compounded of ἀριθμὸς, number, and μαντεια, divination.

ARK, ARC, or ARCH. See the article ARCH.

ARK *of Noah* was a kind of floating vessel, built by the command of God, for the preservation of the several species of animals, at the general deluge. It is derived from the Latin word *Arca*, which signifies a chest or coffer.

As historians and commentators differ widely in their opinions concerning this surprizing vessel, we shall lay before our readers what appears to us most worthy

worthy of their attention, in relation to the following particulars, viz. the time that it took in building, the materials of which it conſiſted, its form, capacity, and reſting-place after the Flood.

It is generally agreed that Noah began to build the ark in the year of the world 1557; but it is not ſo clear at what particular period it was finiſhed. Some have conjectured that he was an hundred and twenty years about it: they are led to this opinion by the following paſſage in Geneſis, where God ſays, "My ſpirit ſhall not always ſtrive with man; his days ſhall be an hundred and twenty years." Others imagine that it was completed in ſeventy-eight years; ſome have aſſigned a much ſhorter period, namely, ſeven or eight years; the Mahometans ſay that he had only two years allowed him for this work. But all this is only conjecture, and it ſeems to be impoſſible to fix the exact time that it took in building; thus much, however, may be collected from the ſacred writings, that it was built ſome time in the fifth and ſixth hundredth year of Noah; for God, when he commanded him to build the ark, told him that he and his wife, and his ſons, and his ſons wives ſhould enter into the ark. Now Noah's three ſons, Shem, Ham, and Japheth, were not born till after Noah was five hundred years old, and it is clear that the deluge happened in the ſix hundredth year of Noah; from which it neceſſarily follows, that the ark muſt have been conſtructed ſome time between the fifth and ſix hundredth year of Noah.

As to the materials, the ſcripture tells us that it was made of *gopher wood*, which is tranſlated by the Septuagint *ſquare pieces of wood*. Some commentators are of opinion that it was cedar, others box, others pine, and others cypreſs. It is tranſlated by Jerom in one place *ligna lævigata*, or *wood that is planed*, and in another *ligna bituminata*, or *wood that is pitched*. Some have maintained that the Hebrew word גפר, *gopher*, ſignifies any kind of pitchy reſinous wood, which is not improbable, as the word גפרית, *gophrit*, literally means *bitumen*, ſulphur, or any other inflammable ſubſtance. Our learned commentator Mr. Fuller has obſerved, that the wood whereof the ark was built, was nothing elſe but that which the Greeks called Κυπαρισσος, or the Cypreſs tree; for taking away the termination, cupar and gopher differ very little in ſound. Bochart has confirmed this obſervation, and ſhewn that no place abounds ſo much with this kind of wood, as the country about Babylon; near which place Noah is generally ſuppoſed to have conſtructed his ark. Pelletier prefers cedar, on account of its incorruptibility, and the great plenty of it in Aſia; whence Herodotus and Theophraſtus relate, that the kings of Egypt and Syria built whole fleets of it, inſtead of pine; and the common tradition throughout the Eaſt imports, that the ark is preſerved entire to this day on Mount Ararat.

There have not been leſs various opinions about the particular form of the ark, than about the particular kind of wood of which it was conſtructed. God commanded Noah to make it three hundred cubits in length, fifty cubits in breadth, and thirty cubits in height. Now the exact dimenſions of it might be known to a tittle, if it was only once agreed what the particular meaſure of this cubit was. But the misfortune of it is, that ſcarce two people are of the ſame opinion as to this point, and therefore it is not to be wondered at if they differ widely in every other. Origen thinks that this cubit was of the ſame dimenſions with ſix common cubits; but the ark in this caſe muſt have been monſtrouſly too large, as it would have taken up near the ſpace of a mile. Others have imagined that it was a geometrical cubit, and contained ſix feet: but the moſt probable opinion is, that it was the common Egyptian cubit, which was made uſe of by the Jews from the time of their departure out of Egypt, till the Babyloniſh captivity. This cubit was pretty near a foot and a half, or twenty-inches and a half of our meaſure. According to this computation, the length of the ark muſt have been 512 feet 6 inches; its breadth 85 feet 5 inches; and its height 51 feet 3 inches: its whole capacity conquently would have been pretty nearly 229822 feet 4 inches. Such a building as this would have contained ſufficient room for all the creatures that were to enter into it; as we ſhall clearly conceive, if we conſider that the number is not ſo great, as might at firſt have been imagined. We are not acquainted with above a hundred and thirty ſpecies of quadrupedes; nor do we know of a greater number of birds; and with regard to reptiles not above thirty ſpecies. Biſhop Wilkins has endeavoured to ſhew that not above ſeventy-two of the quadrupede kind needed a place in the ark.

There are various conjectures about the particular manner in which the ark was laid out. Noah was commanded by God to make it with lower, ſecond, and third ſtories. The lower ſtory was moſt probably deſtined for the beaſts, the middle for the food, and all the upper for the birds, with Noah and his family. Each ſtory was divided into different apartments, ſtalls, &c. Drexelius makes three hundred apartments; father Fournier three hundred and thirty-three: the anonymous author of the Queſtions on Geneſis four hundred; Butes, Temporarius, Arias Montanus, Hoſtas, Wilkins, Lamy, and others, ſuppoſe as many different partitions, as there were different ſorts of animals. Pelletier makes only ſeventy-two, namely, thirty-ſix for the birds, and as many for the beaſts: his reaſon is, that if we ſuppoſe a greater number, as three hundred thirty-three, or four hundred; each of the eight perſons in the ark muſt have had thirty-ſeven, forty-one, or fifty ſtalls to attend and cleanſe daily, which he thinks impoſſible. But there does

not ſeem to be much in this: for to diminiſh the number of ſtalls, without diminiſhing the number of the animals, would be inſignificant; it being, perhaps, more difficult to take care of three hundred animals in ſeventy-three ſtalls, than in three hundred.

Some perſons have computed that all the animals contained in the ark could not be equal to five hundred horſes; nay, they have reduced the whole to the dimenſions of fifty-ſix pair of oxen. Father Lamy enlarges it to ſixty-four pair, or an hundred and twenty-eight oxen: ſo that ſuppoſing one ox equal to two horſes, if the ark had room for two hundred fifty-ſix horſes, there muſt have been room for all the animals. But the ſame author demonſtrates that one floor would ſuffice for five hundred horſes, allowing nine ſquare feet to an horſe.

Biſhop Wilkins computes all the carnivorous animals equivalent, as to the bulk of their bodies and their food, to twenty-ſeven wolves; and all the reſt to two hundred and eighty beeves. For the former he allows 1825 ſheep, and for the latter 109500 cubits of hay; all which would be eaſily contained in the two firſt ſtories, and a deal of room to ſpare.—As to the third ſtory, no body doubts of its being ſufficient for the fowls, with Noah, his ſons, and daughters. The learned biſhop remarks, that the moſt expert mathematician, even at this day, could not have aſſigned the proportions of a veſſel better accommodated to the purpoſe, than was this of Noah's; and concludes in the following words; "The capacity of the "ark, which has been made an objection againſt "ſcripture, ought to be eſteemed a confirmation "of its divine authority; ſince, in thoſe ruder "ages, men being leſs verſed in arts of philoſo-"phy, were more obnoxious to vulgar prejudices "than now: ſo that, had it been an human in-"vention, it would have been contrived according "to thoſe wild apprehenſions which ariſe from a "confuſed and general idea of things; as much "too big as it has been repreſented too little."

According to the ſacred hiſtorian, the ark reſted in the ſeventh month, on the ſeventeenth day of the month, upon the mountains of Ararat. This is a famous mountain in Armenia, ſituated twelve leagues eaſt of Erivan, in a vaſt plain, having no other mountain near it on any ſide. It is called by many of the Eaſtern nations Ar dag, or Parmark-dagh, becauſe it ſtands upright by itſelf, like a finger when held up. It is ſo high as to be ſeen at the diſtance of ten days journey, according to the ſtages of the caravans. The city of Tauris is ſituated near this mountain. Tavernier ſays that there are many monaſteries upon Mount Ararat; and that the Armenians call it Mere Souſſar, becauſe the ark ſtopt here. It is as it were taken off from the other mountains of Armenia, which make a long chain, and from the middle to the top of it is covered with ſnow for three or four months in the year. Notwithſtanding all this, there are ſome authors of opinion that the ark reſted on a mountain near Apamea in Phrygia.

ARK *of the Covenant*, in ſcripture, denotes a ſmall cheſt or coffer, three feet nine inches in length, two feet three inches in breadth, and the ſame in height; in which were contained the golden pot that had manna, and Aaron's rod, together with the tables of the covenant, as well the broken ones (according to the rabbins) as the whole. This coffer was made of ſhittim wood, and was covered with the mercy-ſeat, which was of ſolid gold; at the two ends whereof were two cherubims, looking towards each other with expanded wings, which embracing the whole circumference of the mercy-ſeat, met on each ſide in the middle. Here it was that the ſhechinah, or divine preſence reſted, both in the tabernacle and in the temple, and was viſibly ſeen in the appearance of a cloud over it: and from hence the divine oracles were delivered in an audible voice, as often as God was conſulted in behalf of his people. Hence it is that God is ſaid in ſcripture to dwell between the cherubims on the mercy-ſeat becauſe there was the ſeat or the throne of the appearance of his glory among them. And for this reaſon the high-prieſt appeared before the mercy-ſeat once every year, on the great day of expiation, at which time he was to make his neareſt approach to the divine preſence, to mediate and make atonement for the ſins of the people.

ARM, *Brachium*, a part of the human body, terminating at one end in the ſhoulder, and at the other in the hand.

Anatomiſts divide the arm into two parts, calling only that part the arm included between the ſhoulder and the elbow; the reſt they term the fore-arm. The arm in this acceptation has only one large bone called the os humeri, or the ſhoulder-bone. The other part conſiſts of two bones, termed the radius, and the cubitus, or ulna.

The os humeri has five ſorts of motions, which are effected by five pairs of muſcles; upwards by the deltoides, ſupraſpinatus, and coraco-brachialis; downwards by the rotundus major, and latiſſimus dorſi; forwards by the pectoralis; and backwards by the infraſpinatus.

The muſcle of the fore-arm are the biceps, brachiæus internus, gemellus, brachiæus externus, anconæus, pronator, radii teres et quadratus, ſupiſpinator longus et brevis. Its motions are confined to two kinds, that of rotation, and that of flexion and extenſion.

ARM, among ſportſmen, is applied to a horſe, when by preſſing down his head, he endeavours to defend himſelf againſt the bit, to prevent his being checked by it.

ARM, in geography, implies a branch of the ſea running ſome diſtance into the land.

ARM *of a Magnet* is a ſmall piece of ſteel in the iron incloſure, in which the load-ſtone is placed. See MAGNET.

ARMADILLO, in natural hiſtory, the name of an animal reſembling a hedge-hog, and almoſt of the ſame ſize. His head, body, and tail, are covered with a ſhield of a bony ſubſtance, and very curiouſly contrived with moſt beautiful ſcales. Near the hind part of the head are two joints, that he may move his head; and on the back ſeven diviſions, or ſhields, with a yellow ſkin between each. The feet are alſo covered with a thinner ſhield. The lower parts of his body are without this covering, but are beſet with hairs near an inch long, which proceed from prominent pores. There are alſo a few hairs on the ſkin, which joins to ſeveral ſhells of the ſhield, like the former; as alſo near the mouth and eyes.

The head is like a hog, with a ſharp ſnout: it has little eyes ſunk deep in the head, and a pointed narrow tongue. The ears are naked, brown, and ſhort; the teeth are of a middle ſize, and eighteen in each jaw. The feet reſemble hands, with five fingers, and roundiſh nails. He roots up the ground with his ſnout, like a hog; and is tinctured all over with a reddiſh colour. The tail at the root is near four inches thick; but grows leſs gradually to the end, which terminates in a point. He lives upon melons, potatoes, and other roots; and will eat fleſh when he can get it. He generally lies hid in the ground, and ſometimes will frequent water and watery places, where he feeds upon worms, ſmall fiſh, and water inſects. Sometimes he will eat ants, apples, and the berries of certain trees.

ARMED *Ship*, in the marine, a veſſel taken into the ſervice of the government, and equipped by them in the time of war, being furniſhed with artillery, ammunition, and martial inſtruments: they are commanded by an officer who has the rank of maſter and commander in the navy, and are upon the ſame eſtabliſhment with ſloops of war, having a lieutenant, maſter, purſer, ſurgeon, &c.

ARMENICA, apricot, in botany. See APRICOT.

ARMENIANS, in eccleſiaſtical hiſtory, a ſect or diviſion among the eaſtern Chriſtians, ſo called from Armenia, the country which they originally inhabited. There are two ſorts of Armenians, the one catholic and ſubject to the pope, having a patriarch in Perſia, and another in Poland: the other are ſectaries, and are generally accuſed of being Monophyſites, i. e. of admitting only one nature in Chriſt. They likewiſe have two patriarchs, one in the convent of Etchmiazin, near Erivan, a city of Armenia, ſubject to the king of Perſia; and the other at Cis, in Cilicia, ſubject to the Grand Signior.

The Armenians agree with the Greeks, except in this, that they mix no water with their wine in the eucharift, and uſe unleavened bread after the manner of the Latins. They abſtain in the moſt rigid manner from eating blood, and things ſtrangled, and are greatly addicted to faſting; inſomuch that, to hear them talk, one would conclude their religion conſiſted in nothing elſe.

ARMILLA-MEMBROSA, in anatomy, is that circular ligament which comprehends all the tendons belonging to the whole hand within a circle, in the region of the carpus.

ARMILLARY, in a general ſenſe, implies ſomething compoſed of rings or circles.

The word is Latin, *armillaris*, and derived from *armilla*, a bracelet

ARMILLARY *Sphere*, an artificial ſphere compoſed of a number of circles of the mundane ſphere, put together in their natural order, to eaſe and aſſiſt the imagination, in conceiving the conſtitution of the heavens, and the motions of the celeſtial bodies. See Plate IV. *fig.* 6.

The armillary ſphere revolves upon its axis within a ſilvered horizon, which is divided into degrees, and moveable every way upon a braſs ſupporter. The other parts are the equinoctial, zodiac, meridian, the two tropics, and the two polar circles.

ARMINIANS, in eccleſiaſtical hiſtory, ſometimes called REMONSTRANTS, are a religious ſect or party, who took their name from Arminius, their leader and advocate. They firſt of all ſprang up in Holland, by a ſeparation from the Calviniſts; whoſe catechiſms and formulas of faith they rejected and ridiculed. They hold election and predeſtination; regard the doctrine of the Trinity as not eſſential to ſalvation; maintain that there is no precept in Scripture, which commands the worſhip of the Holy Ghoſt; and affirm that Jeſus Chriſt is not equal to God the Father.

ARMISTICE, in military affairs, a temporary truce, or ceſſation of arms for a very ſhort ſpace of time.

The word is Latin, *armiſtitium*, and compounded of *arma*, arms, and *ſto*, to ſtand, or ſtop.

ARMOSIN, a kind of ſilk ſtuff, manufactured in the Eaſt-Indies, at Lyons in France, and at Lucca in Italy.

ARMONIAC, or AMMONIAC. See SAL *Ammoniacum*.

ARMORIAL, ſomething relating to arms, or coats of arms.

ARMORY, a magazine of arms, or a place where military habiliments are depoſited, that they may be ready for uſe.

ARMORY alſo implies a branch of the ſcience of heraldry, conſiſting in the knowledge of coats of arms, with regard to the blazonry and various intendments.

ARMOUR, all such habiliments as serve to defend the body from wounds, especially those given by darts, swords, lances, &c.

ARMOURER, a person who makes or deals in arms or armour.

ARMS, *Arma*, in a general sense, all kinds of weapons, whether offensive or defensive.

ARMS, in a legal sense, extend to any thing a person wears for his own defence, or takes in his hand, and uses in anger, to strike or throw at another.

ARMS, or ARMORIES, in heraldry, signify marks of honour borne upon shields, banners, and coats, in order to distinguish kingdoms, states, families, and persons.

Charged ARMS are such as retain their antient integrity, with the addition of some new honourable bearing.

Canting or *Vocal* ARMS, those in which there are some figures alluding to the name of the family.

Full or *Intire* ARMS, such as retain their primitive purity, without any alterations or abatements.

False ARMS, such as are not conformable to the rules of heraldry.

ARMS, in falconry, imply the legs of a hawk from the thigh to the foot.

ARMY, a large number of soldiers, consisting of horse and foot, completely armed, and provided with artillery, ammunition, &c. under the command of one general, with proper officers under him.

An army is composed of squadrons and battalions, and is usually divided into three corps, and formed into three lines. The first is called the vanguard, the second the main body, and the third the rear-guard.

ARNOLDISTS, in ecclesiastical history, a sect of separatists, so called from their leader, Arnold of Breise, a great declaimer against the wealth and vices of the clergy. He is also charged with preaching against baptism and the eucharist.

AROMATIC, an epithet applied to such plants and other bodies as yield a fine fragrant smell, and have a warm spicy taste.

AROPH, a term frequently used by Paracelsus for lithontriptic medicines.

AROURA, a Grecian long measure, containing fifty feet. It was also frequently used for a square measure of half the plethron. The Egyptian aroura was the square of a hundred cubits.

ARPENT, a term sometimes used to denote an acre.

ARQUEBUSS. See HARQUEBUSS.

ARQUEBUSS *a croc*, in military affairs, a fire-arm still found in most old castles, pretty much resembling the barrel of a musket, and sustained by an iron swivel which is fastened to its barrel, and supported by a foot called a *chevalet*, or three-legged horse. This piece was formerly much used to mount on battlements, and at loop-holes; but is now almost entirely neglected, being used no where but in old forts and castles where it is found. The barrel of an arquebuse a croc, is larger than that of a musquet, but much less than a cannon's; they are charged in the same manner as a cannon, and like them, fired with a match; the range of this piece is greater than that of a musket.

ARRACHEE, in heraldry, a term applied to the representation of plants torn up by the roots.

ARRAC. See ARAC.

ARRAY, in law, implies the ranking or setting forth a jury or inquest of men impannelled on some cause.

Battle ARRAY, the order or disposition of an army drawn up with a view to engage the enemy.

ARREARS, the remainder of a sum due, or money remaining in the hands of an accountant. It likewise signifies the money due for rent, wages, &c. or what remains unpaid of pensions, taxes, &c.

ARRENATION, in the forest laws, implies the licensing the owner of lands in a forest, to inclose them with a low hedge and a small ditch, in consideration of a yearly rent.

ARREST, the apprehending and seizing a person, in order to oblige him to be obedient to the law; which in all cases, except treason, felony, or breach of the peace, must be done by virtue of a precept out of some court. See WRIT.

ARREST *of Judgment*, the assigning just reason why judgment should not pass, as want of notice of the trial, a material defect in the pleading, when the record differs from the deed impleaded, when persons are mis-named, where more is given by the verdict than is laid in the declaration, &c. This may be done either in criminal or civil cases.

ARRESTS, in farriery, mangy tumours between the ham and the pastern of a horse's hind legs. See RAT-TAILS.

ARRHEPHORIA, a festival among the Athenians, in honour of Minerva. The ministers who assisted at it were boys and girls, between seven and twelve years of age.

The word is Greek, and compounded of ἀρρητον, mystery, and φερω, to carry.

This feast was also called Hersiphori, from Herse, the daughter of Cecrops, on whose account it was instituted.

ARRIERE, the hinder or posterior part of any thing. See REAR.

ARRONDEE, in heraldry, implies a cross, the arms of which are composed of sections of a circle.

ARROW, a missive weapon, sharp-pointed and barbed, designed to be shot from a bow. See Bow.

ARROW, among furveyors, implies a ſmall ſtick generally ſhod with iron, to ſtick into the ground, at the end of the chain.

ARSCHIN, in commerce, a long meaſure uſed in China to meaſure ſtuffs. Four arſchins make three Engliſh yards.

ARSENIC, a poiſonous mineral ſubſtance, frequently found mixed with other matters.

The chemiſts have formed various conjectures about the nature of this ſingular concrete; but have not been able to determine what it really is, or to what claſs of bodies it belongs. They have called it ſulphureous, unctuous, mercurial, a mineral juice, &c. without foundation. Boerhaave, in his Elementa Chemiæ, ranks it under the head of ſulphurs, and ſays it approaches nearer to the nature of ſulphur than of any other known mixt body: it wants, however, the peculiar qualities by which ſulphur is diſtinguiſhed. Stahl, with greater probability ſuppoſes it to be of a ſaline nature. In ſome of its ſtates, it apparently poſſeſſes properties attributed to ſalts alone; but in other ſtates, it is as obviouſly metallic.

White arſenic, or arſenic ſtrictly ſo called, is a moderately heavy, compact, hard, brittle concrete; of a cryſtalline or vitreous appearance, gradually changing, from expoſure to the air, to a milky hue like that of porcelain, and at length to the opake whiteneſs of white enamel. The larger maſſes preſerve their tranſparency longer than the ſmall; in a dry longer than in a moiſt air.

In the fire, it neither burns, nor perfectly melts; but totally and readily exhales in thick fumes, of a ſtrong fetid ſmell reſembling that of garlic. The fumes, caught in proper veſſels, condenſe, either into cryſtalline maſſes again, or into a white powder, according as the receiver is leſs or more removed from the heat.

Mixed with inflammable matters, and expoſed to the fire in a retort or other like veſſel, it aſſumes a metallic appearance. In this ſtate, it greatly reſembles regulus of antimony; being, like that ſemimetal, of a bright ſparkling whitiſh colour, a plated or leafy texture, and very brittle: but its whiteneſs ſoon changes in the air to a dark blackiſh hue. It ſtill continues volatile, as in its unmetallic form: it burns and calcines in the fire, and ſublimes into white arſenic, as at firſt.

Arſenic reduced into fine powder, and boiled in fifteen times its weight of water, totally diſſolves. If the ſolution be evaporated a little, the arſenic ſhoots, on cooling, into cryſtals, which frequently have a yellowiſh tinge. The entire cryſtals are not taken up again by boiling water; but when finely pulverized, they diſſolve as at firſt. The ſolution has a nauſeous taſte, but not a ſaline ſharpneſs.

Arſenic diſſolves both in acid and in alkaline liquors, but makes no effervescence with either: in fixed alkaline lixivia it diſſolves very plentifully; in acids, more ſparingly. Arſenic in its ſemimetallic form, called regulus, is eaſier of ſolution than the white arſenic or calx.

Arſenic is employed for ſundry mechanic uſes; by the dyers, as an ingredient in the compoſitions of ſcarlet and other fine reds; by the girdlers and pinmakers, for whitening their braſs or copper; by the goldſmiths, for enamelling; by the glaſs-makers, for promoting the fuſion of the frits, and the clearneſs and tranſparency of the glaſs; by the porcelane-makers, in white glazings; by the preparers of compound metals, for communicating a ſilver whiteneſs to copper; by the aſſayers, it is uſed, in the form of glaſs, for promoting the ſcorification of refractory ores, which participate of tin and antimony, and which will not work off, but run into lumps in the cupel. A certain artiſt at Berlin prepares a beautiful metal, like the fineſt ſteel, by melting caſt iron with arſenic and glaſs, and adding a little tin during the fuſion: the beauty of the metal depends in a great meaſure upon the proportions. In Vienna, a metal is made for ornamental uſes, reſembling the fineſt ſilver, from iron, tin, and arſenic; perhaps with the addition of a little copper. Arſenic is uſed alſo in ſolders, or for uniting iron with tin, in ſome places in the making of tinned iron plates.

Arſenic is a moſt violent poiſon to all animals; unleſs the wolf ſhould be an exception, who is ſaid, probably without ſufficient foundation, to be only purged by it. The utmoſt caution is therefore neceſſary, in all operations upon arſenic, to avoid its fumes: it is on account of the danger attending ſuch operations that this mineral has hitherto been ſo little examined by the chemiſts. The deſtroying of rats, or other domeſtic animals, by means of arſenic, is full of danger; the operation of the poiſon being ſuch, that great part of it is diſcharged, and the animal induced to drink: hence foods, liquors, and the provender of cattle, have too often received a poiſonous taint. If we cannot catch thoſe animals, we may nevertheleſs be cleared from them by much ſafer means than the uſe of arſenic: freſh night-ſhade is their enemy. If the juice of the leaves or berries of that plant, or the diſtilled water of the freſh herb, be made into pellets with meal, the rats, without taſting the pellets, will forſake the places where they are laid.

ARSIS and THESIS, in muſic, is a term applied to compoſitions, in which one part riſes and the other falls.

ARSMART, in botany, the name of ſeveral ſpecies of perſicaria. See PERSICARIA.

ART, *Ars*, a ſyſtem of rules ſerving to facilitate the performance of certain actions; in which ſenſe it ſtands oppoſed to ſcience, or a ſyſtem of ſpeculative principles.

Arts are commonly divided into liberal and mechanical; the former comprehending poetry, painting, ſculpture, architecture, &c. and the latter, the whole body of mechanical trades, as carpentry, maſonry, turnery, &c.

ART and PART, in the law of Scotland, is applied to an accomplice.

ARTEDIA, in botany, a genus of pentandrious plants, with hairy leaves much reſembling thoſe of the carrot; the flower ſtalks are terminated with large umbels of white flowers, compoſed of five unequal petals; theſe are ſucceeded by roundiſh compreſſed fruit, each having two ſeeds, which are oblong, and their borders ſcaly.

ARTEMISIA, mugwort, in botany, a genus of plants producing a flower, compoſed of hermaphrodite and female floſcules, the diſk or middle compoſing the hermaphrodite, which are funnel-ſhapped and cut in five parts at the brim, containing five capillary filaments; on the border are ranged the female floſcules, which have a germen at their bottoms, ſupporting a ſingle ſtyle; they both afterwards produce each a ſingle naked ſeed. The common mugwort is perennial, and grows wild in fields and waſte grounds, and flowers in June; the ſtalks of it are firm, and of a purpliſh colour; the leaves are deeply divided, of a dark green colour above, but hoary underneath, and much like common wormwood; and the flowers ſtand erect in ſpikes on the tops of the branches: to this genus Linnæus has added the ſouthernwood and wormwood.

The common mugwort is ſaid to be opening and diſcuſſive, and has been chiefly recommended for promoting the uterine evacuations, and abating hyſteric ſpaſms, for which purpoſe infuſions of it have been drank as tea: amongſt midwives and nurſes it is held in the greateſt eſteem, as it is much uſed in complaints peculiar to the female ſex, both in inward and outward applications.

The moxa, ſo famous in the eaſtern countries for curing the gout, by burning the part affected, is the down which is on the under part of the leaves of a ſpecies of the artemiſia, and is by ſome ſuppoſed to be the yzcecuinpathi of Hernandez.

ARTERIAL, in anatomy, any thing belonging to, or that performs the office of, an artery.

ARTERIAL *Vein*, in anatomy, a name given to the pulmonary artery.

ARTERIOTOMY, the opening an artery in order to procure an evacuation of blood.

The word is Greek, αρτηριοτομια, and compounded of αρτηρια, an artery, and τεμνω, to cut.

ARTERY, in anatomy, a conical tube or canal, which conveys the blood from the heart to all parts of the body.

An artery is compoſed of three membranes or coats; the outermoſt of which appears to be a web of fine blood veſſels and nerves, for conveying nouriſhment to the interior membranes. The next is compoſed of circular or ſpiral fibres, of which there are more or fewer, according to the magnitude of the artery. Theſe fibres, being very elaſtic, contract themſelves with ſome force, when the power ceaſes by which they have been extended. The third and innermoſt membrane is of a denſe contexture, yet fine and tranſparent. It ſerves to keep the blood within its channels, which otherwiſe would, upon the dilatation of the artery, ſeparate the ſpiral fibres from one another. The pulſe of the arteries conſiſts of two reciprocal motions, like the pulſe of the heart, being a ſyſtole and a diaſtole, keeping oppoſite times; the ſyſtole of the one anſwering to the diaſtole of the other.

The arteries of the human body are, ſtrictly ſpeaking, only two, namely, the aorta, and the pulmonary artery; all the other arteries, though diſtinguiſhed by proper names, being only branches of theſe two.

The aſcending aorta, which ariſes immediately from the left ventricle of the heart, preſently after gives two arteries, called coronary ones, to the heart itſelf. A little above this it is divided into three aſcending branches, from which are formed the two carotids, and the two ſubclavians; and from theſe laſt proceed the muſcularis colli, the external ſcapulary artery, the ſuperior intercoſtals, the mediaſtinal artery, the ſuperior diaphragmatic artery, the mammary artery, and the axillary arteries: all which are ſubdivided into leſſer branches.

From the deſcending trunk of the aorta, proceed in the following order, the bronchial artery, the inferior intercoſtals, the arteries of the œſophagus, the interior diaphragmatics, the cœliac, ſuperior meſenteric, the renal or emulgent arteries, the ſacra, and two iliacs. Theſe are the main branches ſent out from the deſcending aorta, each of which is again ſubdivided into many leſſer branches.

But Plate XV. which is taken from Drake's Anatomy, will give a much better idea of the arteries of the human body, than is poſſible to be conveyed by words.

1. The aorta cut from its origin at the left ventricle of the heart. *Fig.* 3. of the ſame plate, repreſents part of the trunk of the aorta turned inſide out; *a*, *a*, the internal, or nervous coat; *b*, *b*, the muſcular coat; *c*, the external, or vaſcular coat.

A. The three ſemi-lunar valves of the aorta, as they appear when they hinder the blood from coming back into the left ventricle of the heart, in its diaſtole.

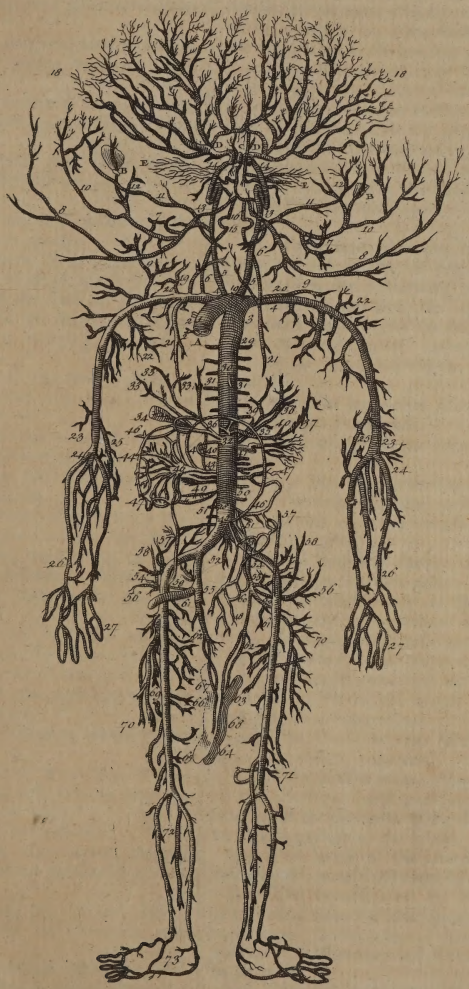
2, 2. The trunk of the coronary arteries ariſing from the aorta.

3. Ligamentum arterioſum.

4, 4. The ſubclavian arteries.

5, 5. The

Facing Artery.



J. Lodge Sculp

5, 5. The two carotid arteries.

6, 6. The two vertebral arteries, which arise from the subclavicula, and pass through all the transverse processes of the vertebræ of the neck.

7, 7. The arteries which convey blood to the lower part of the face, tongue, adjacent muscles and glands.

8, 8. The trunks of the temporal arteries springing from the carotids, and giving branches to the parotid glands.

9, 9. Branches of the temporal arteries, conveying blood to the neighbouring muscles, the hairy scalp, and forehead.

10, 10. The trunks which send blood to the foramina narium, particularly to the glands of its mucous membrane.

11, 11. The occipital arteries, whose trunks pass close by the mammiform process.

12, 12. Muscles which carry blood to the fauces, gargareon, and muscles of those parts.

B, B. Small portions of the basis of the skull, perforated by the artery of the dura mater, part of which is represented as hanging to the arteries.

13, 13. The contortions of the carotid arteries, before they pass the basis of the skull to the brain.

14, 14. Those parts of the carotid arteries, where they pass by each side of the sella turcica, where several small branches arise from them, and help to compose the rete mirabile.

C. The glandula pituitaria, taken out of the sella turcica, lying between the two contorted trunks of the carotid arteries, marked 14, 14.

D, D. The arteriæ ophthalmicæ, which spring from the carotids before they enter the pia mater.

15. The contortions of the vertebral arteries, as they pass the transverse processes of the first vertebræ of the neck, towards the os occipitis.

16. The two trunks of the vertebral arteries that lie on the medulla oblongata.

17. The communicant branches between the carotid and cervical artery.

18, 18. The ramifications of the arteries within the skull, the larger trunks of which lie between the lobes of the brain, and its sulci.

E, E. The arteries of the cerebellum.

19, 19. The arteries of the larynx, thyroid glands, and adjacent muscles and parts arising from the subclavian arteries.

20, 20. Others arising near the former, which convey blood to the muscles of the neck and scapula.

21, 21. The mammariæ, which arise from the subclavian arteries, and descend on the cartilages of the true ribs internally, on each side the os pectoris or sternum. Some branches of these pass through the pectoral as well as intercostal muscles, and give blood to the breasts, where they meet some branches of the intercostal arteries.

22, 22. The arteries of the muscles of the os humeri, and some of those of the scapula.

23, 23. Those parts of the large trunks of the arteries of the arm, which are liable to be wounded in opening the vena basilica, or innermost of the three veins in the bending of the cubit.

25, 25. A communicant branch of an artery arising from the trunk of the artery of the arm, above its flexure at the cubit, which is inosculated with the arteries below the cubit.

26, 26. The external artery of the cubit, which makes the pulse near the carpus.

27, 27. Arteries of the hands and fingers.

28, 28. The descending trunk of the arteria magna.

29. The bronchial artery, springing from one of the intercostal arteries: it sometimes arises immediately from the descending trunk of the aorta; and at other times from the superior intercostal artery which springs from the subclavian.

30. A small artery, springing from the fore parts of the aorta descendens, and passing to the gula.

31, 31. The intercostal arteries on each side the arteria magna descendens.

32. The trunk of the arteria cæliaca, whence spring,

33, 33. The hepatic arteries, and

34. The arteria cystica, or the gall-bladder.

35. Arteria coronaria ventriculi inferior.

36. The pylorica.

37. The epiploica dextra, sinistra, and media, springing from the coronaria.

38. The ramifications of the coronary artery, which embrace the bottom of the stomach.

39. Coronaria ventriculi superior.

40, 40. The phrenic arteries, or the two arteries of the diaphragm; that on the left side arising from the trunk of the arteria magna; the right springing from the cæliaca.

41. The trunk of the splenic artery, arising from the cæliaca, contorted.

42. Two small arteries going to the upper part of the duodenum and pancreas; the rest of the arteries of the pancreas spring from the splenic artery in its passage to the spleen.

43. The trunk of the arteria mesenterica superior turned towards the right side.

44. The branches of the superior mesenteric artery freed from the small guts. Here the various anastomoses the branches of this artery make in the mesentery, before they arrive at the intestines, may be observed.

45. The inferior mesenteric artery arising from the arteria magna.

46. Remarkable anastomoses of the mesenteric artery, with the superior.

47, 47. The

47, 47. The branches of the inferior meſenteric artery, as they paſs to the inteſtinum colon.

48. Thoſe of the rectum.

49. The emulgent arteries of the kidneys.

50. The vertebral arteries of the loins.

51, 51. The ſpermatic arteries, which deſcend to the teſtes, and are ſo ſmall as to eſcape being filled with wax.

52. Arteria ſacra.

53. Arteriæ iliaci.

54, 54. Rami iliaci externi.

55, 55. Iliaci interni.

56, 56. The two umbilical arteries cut off; that on the right ſide is drawn as in the fœtus, and the left expreſſed as in an adult.

57, 57. The epigaſtric arteries, which aſcend under the right muſcles of the abdomen, and are inoſculated with the mammariæ.

58, 58. Branches of the external iliac arteries, paſſing between the two oblique muſcles of the abdomen.

59, 59. Branches of the internal iliac arteries, which convey the blood to the extenſores and obturatores muſcles of the thighs.

60, 60. The trunks of the arteries which paſs to the penis.

61, 61. The arteries of the bladder.

62, 62. The internal arteries of the pudendum, which, with thoſe here expreſſed with the penis, make the hypogaſtric arteries in women.

63. The penis extended with wax, and dried.

64. The glans penis.

65. The upper part of the dorſum penis, cut from the body of the penis, and raiſed, to ſhew the corpora cavernoſa penis.

66. Corpora cavernoſa penis, freed from the oſſa pubis, and tied after inflation.

67. The two arteries of the penis, as they appear injected with wax.

68. The capſula and ſeptum of the corpora cavernoſa penis.

69. The crural arteries.

70, 70. The arteries which paſs to the muſcles of the thighs and tibiæ.

71. That part of the crural artery that paſſes the ham.

72. The three large trunks of the arteries of the legs.

73. The arteries of the foot, with their communicating branch, from their ſuperior to their inferior trunk, as well as their communications at the extremity of each toe, like thoſe of the fingers.

Rough ARTERY, or aſpera arteria. See ASPERA ARTERIA.

ARTHANITA, ſowbread, in botany, a low plant, without any other ſtalk than the ſlender pedicles of the leaves and flowers: the leaves are pretty large, round, of a green colour, above with white ſpecks, and purpliſh underneath: the flowers purpliſh, monopetalous, deeply divided into five ſegments, followed by round ſeed veſſels: the roots large, ſomewhat globular, with ſeveral fibres, blackiſh on the outſide, and white within. It is perennial, a native of the ſouthern parts of Europe, and cultivated in ſome of our gardens.

ARTHRITIS, in medicine, a diſeaſe well known by the appellation of the gout. See the article GOUT.

The word is Greek, and derived from ἄρθρον, a joint; becauſe the chief ſeat of that diſtemper is in the joints.

ARTHRODIA, in anatomy, a ſpecies of articulation, wherein the flat head of one bone is received into a ſhallow ſocket in the other. The humerus and ſcapula are joined by this ſpecies of articulation.

The word is Greek, and compounded of ἄρθρον, a joint, and δέχομαι, to receive.

ARTHRODIUM, in natural hiſtory, a genus of imperfect cryſtals, always found in complex maſſes, and forming long ſingle pyramids, with very ſhort and ſlender columns. See CRYSTAL.

ARTICHOKE, cynara, in botany, a well known plant, of which there are two ſorts cultivated in gardens; one known by the name of the globe artichoke, and the other called the French artichoke. The globe artichoke produces large round heads, with broad brown ſcales turning inward: the eatable part at the bottom of the ſcales is very thick, and better flavoured than the other ſort, which produces taller ſtalks, with leſs heads, and conically ſhaped; the ſcales are narrower, and have leſs fleſh at their bottoms; on which account the French ſort is pretty much excluded from the Engliſh gardens, the other being conſiderably preferable.

The artichoke delights in a deep rich and moiſt ſoil, well prepared with rotten dung, and mixed to the depth of three feet at leaſt; for the deeper the mould is, the leſs watering they will require in ſummer, and produce larger and better flavoured heads. The manner of propagating this plant, is from the ſlips or ſuckers (though they may be raiſed from ſeed) which ariſe from the old roots in February or March, or as ſoon as the hard froſts are over, which if planted in a proper ſoil will produce good fruit in the autumn following. Theſe ſuckers ſhould be carefully taken off with roots to them, particularly where a freſh plantation is intended; and as they are pretty deep in the ground, the earth ſhould be removed from around the mother plant, to take them off the more eaſily, leaving two or three of the ſtraighteſt, cleareſt, and moſt promiſing plants, which are produced from the under part of the ſtock, for a crop, obſerving in ſlipping off the other ſuckers, to be careful not to injure thoſe which are deſigned to remain,

main. When this operation is done, the earth ſhould be drawn to the plants which are left, and well cloſed to them, cutting off the extremity of the leaves which hang down; after which, the ground between them ſhould be dug, and a crop of ſpinage may be ſown, which will be taken off before the artichokes cover the ground. Toward the latter end of April, or beginning of May, when the plants begin to ſhew their fruit, all the young ſhoots produced from the root ſince the laſt dreſſing ſhould be diſplaced, ſo as to leave only the principal plants which are intended for fruiting, which will by that means bear the better, and likewiſe to take off all the ſuckers that are produced from the ſides of the ſtalk, leaving only the principal head, which will cauſe the fruit to be conſiderably larger. When the artichokes are fit to be uſed, they ſhould be cut, and the ſtalks broke off cloſe to the ſurface of the ground, in order that the ſtocks may make freſh ſhoots before the end of October, which is the ſeaſon for earthing them up, although it may be deferred till any time in December, provided the ſeaſon proves mild.

The method of earthing artichokes, (or landing them, as by ſome called) conſiſts in cutting off all the young ſhoots quite cloſe to the ground, then digging a trench between each row, and covering the roots with the earth thrown up in form of a ridge, over the line of the artichokes: this will ſecure them from the froſts that are common, and is by far much better than covering them with long dung, which is a bad practice, becauſe the dung laying near the roots is very apt to rot them, beſides harbouring of vermin, which may deſtroy the roots; though it would not be amiſs in very ſevere froſts, to put ſtraw, peas-haulm, &c. on the ridges, which will keep ſome part of the extremity of the weather from them, without damaging the roots; but this covering need not be uſed till there is no avoiding it, and ſo ſoon as the weather becomes mild, it ſhould be taken off, for it will be a diſſervice to the plants, if it lies too long on them. After the plants are earthed up with the afore-mentioned precautions, they will not want any farther care till February or March, when they will have grown through the ridge of earth, and muſt be managed as before-directed.

Though the ſtocks of artichokes will laſt ſeveral years in a good rich ſoil, yet as they are great impoveriſhers of the ground, their fruit will dwindle ſo as to render it neceſſary to have a freſh plantation every fourth or fifth year, or rather every year, on account of having their fruit in autumn; for this purpoſe, the ground being prepared and proviſion made of a ſufficient number of ſuckers, make choice of thoſe which are clear, ſound, and not woody, having ſome fibres to their bottom; with a knife cut off the knotted part which joined to the ſtalk. If it cuts criſp and tender, it is a ſign of the ſucker's being good; but if tough and ſtringy, it is to be rejected. Having properly ſingled out thoſe which are fitting for the purpoſe, cut the large outſide leaves off pretty low, in ſuch a manner that the middle leaves may riſe above them; the plant being thus prepared, the beſt method of planting is in rows as ſtrait as poſſible, which muſt be done by ranging a line acroſs the ground, ſetting them at about two feet aſunder in each row; and if more rows are wanted than one, theſe ſhould be at the diſtance of five feet, and the plants ſet in quincunx order: the depth they ſhould be planted to be about four inches, and the earth well cloſed about the roots; and if the ſeaſon proves dry, they ſhould be often watered till they have taken good root: if the ſeaſon proves favourable for them, and particularly on a moiſt rich ſoil, theſe plants will produce the largeſt and beſt artichokes ſome time in Auguſt and September, after the old ſtocks have ceaſed bearing; ſo that the ſeaſon is conſiderably lengthened for producing this fruit, by making a new plantation every year.

The kitchen-gardeners near London, who endeavour to make the moſt of every inch of their high-rated land, generally plant their rows of artichokes nine or ten feet aſunder, and beſides ſowing between them radiſhes or ſpinage, they plant two rows of cauliflowers, at the diſtance of two feet and a half aſunder in rows, and four feet from row to row, ſo that full five feet are allowed for the artichokes. In May when the crop of radiſhes or ſpinage is off, they ſow along the middle of the ſpace between the two rows of cauliflowers, a line of cucumbers for pickling, at the diſtance of three feet; and between the cauliflowers and artichokes, they plant for winter-uſe a row of cabbages, or ſavoys, which have room enough to grow after the cauliflowers and artichokes are taken off: thus the ground is fully cropped during the whole ſeaſon. A moiſt rich ſoil always yield the largeſt and beſt artichokes, but if it be very moiſt, the roots will not live through the winter: ſuch ground ſhould therefore be allotted for freſh plantations, made every ſpring, to ſupply the table in autumn, after the old ſtocks have done bearing; but for early fruit, the plants ſhould be in a drier ſituation; they ſhould be alſo in an open place, that is free from the drip of trees, for they would draw the plants up weak, and thereby render the fruit ſmall and trifling. If the artichoke ſtocks ſhoot forth but weakly in the ſpring, as they will do if they have been hurt by froſt, or too much wet, it is beſt to uncover them with a ſpade, looſening and breaking the mould around them, or rather to dig the whole ground, if it be not planted with any thing elſe, and then to earth or raiſe a ſmall hill about each ſtock, which will greatly help them: in about three weeks or a month after, the ſlips will be fit to take off.

The bottoms of artichokes are good for many culinary uſes. The way to preſerve them all the winter is to ſeparate them from the leaves or ſcales, parboil them, and hang them up in a dry place, ſtrung on packthread, with a clean piece of paper between every bottom, to prevent their touching one another; they are likewiſe ſaid to be very good pickled. The artichoke ſuckers, which grow on the ſides of the ſtalk, are alſo uſed in ſeveral intentions in cookery.

Artichokes are accounted a diuretic, and good againſt the jaundice; but they are more eſteemed as a food than a medicine. For the generical characters of the artichoke, ſee the article CYNARA.

ARTICHOKE *of Jeruſalem*. See HELIANTHUS.

ARTICLE, a ſmall part of a book, writing, account, treaty, or the like.

ARTICLE, in anatomy, implies the juncture of two bones deſigned for motion.

ARTICLE, in arithmetic, denotes any number that can be divided into ten equal parts, as 10, 20, 30, &c.

ARTICLE, in grammar, ſignifies a particle which is made uſe of in moſt languages to expreſs the caſe, gender, and circumſtance of nouns.

In thoſe languages whoſe termination does not vary, or, to ſpeak more accurately, whoſe nouns have no particular declenſion, articles are abſolutely neceſſary to determine their caſes, or ſhew what relation they ſtand in, with regard to the verb. Thus the Italians have their *il*, *lo*, *la*; the Germans their *der*, *das*, *dat*; the French their *le*, *la*, *les*, by which they mark the circumſtances of their nouns.

In Engliſh we have two articles, *a*, and *the*; the former of which is an *indefinite* article, becauſe applied to nouns in their more general ſignification; and the latter *definite*, or demonſtrative, becauſe it fixes the ſenſe of the word it is put before to one individual thing. Thus, if we tranſlate the following words, which Satan made uſe of to our Saviour, *Si tu es filius Dei*, "If thou art *a* ſon of God," we degrade Chriſt into the order of angels, who are called in Scripture the ſons of God; whereas if it is rendered "If thou art *the* Son of God," it is then making him the Meſſiah, or the only begotten of the Father.

The Latins make uſe of no article; but inſtead of it, when they would mark any thing particularly, they employ the pronouns *is*, *hic*, *ille*, *iſte*,—thus, *Bonum erat* ei, *ſi natus non fuiſſet homo ille*, "It "were well for *thee*, or *that* man, if he had not "been born:" thus too, in Virgil, *Hæc* illa *Charybdis*, "This is *the* Charybdis." The Greeks have their ὁ, which is conſtantly prefixed to a word when they intend to mark it as particular, or emphatic: thus, in the firſt chapter of St. John, Εν αρχη ην ο λογος, και ο λογος ην προς τον θεον, και θεος ην ο λογος; which ought to be tranſlated thus, "In "the beginning was *the* Word, and *the* Word "was with God (i. e. with the only one true "God) and the word was *a* God, or as a God:" it ſhould not be tranſlated *God*, for then there ought to have been the article ὁ, to have diſtinguiſhed and made it emphatic. And here I cannot help remarking how blind has been the zeal of ſome well-meaning people, who have fixed upon this one text in Scripture, preferably to all others, to confute the followers of Arianiſm, when this, perhaps of all others, is one under which they can beſt ſhelter themſelves.

It is not agreed by grammarians under what claſs of words the article ſhould be reckoned: ſome make it a diſtinct part of ſpeech, others will have it to be pronoun, and others again a noun adjective. This does not ſeem to be a very intereſting point, and ſo we ſhall beg leave to drop it, juſt as we found it, without determining any thing of the matter.

ARTICLE *of Death*, *articulus mortis*, the laſt pangs, or agony of a dying perſon.

ARTICLE *of Faith*, a point of religious doctrine, allowed and received by ſome church or religious ſect, as having been revealed from heaven.

ARTICLES *of the Clergy*, certain ſtatutes relating to eccleſiaſtical perſons and cauſes, made in the reigns of Edward the Second and Third.

ARTICLES *of Religion*, the thirty-nine heads of the proteſtant faith, drawn up by the biſhops Cranmer and Ridley, and publiſhed by regal authority in the reign of Edward the Sixth.

ARTICULARIS MORBUS, the diſeaſe of the joints, generally called the gout. See GOUT.

ARTICULATE *Sounds*, ſuch ſounds as expreſs the letters, ſyllables, or words of any alphabet or language; ſuch as are formed by the human voice.

ARTICULATED, ſomething furniſhed with, or conſiſting of joints.

ARTICULATED *plants*, are ſuch as are diſtinguiſhed from ſpace to ſpace, by knots or joints along their ſtems.

ARTICULATION, in anatomy, implies the juncture of two bones intended for motion.

Articulation is of two kinds, diarthroſis and ſynarthroſis, the former being that which admits of a manifeſt motion, and the latter that which allows only of an obſcure motion. See DIARTHROSIS and SYNARTHROSIS.

Diarthroſis is ſubdivided into enarthroſis, arthrodia, and ginglymus. See each under its proper article. And ſynarthroſis is ſubdivided into ſymphyſis, ſyntenoſis, ſutura, harmonia, ſyſſarcoſis, ſycondroſis, and ſynneuroſis. See the articles SYMPHYSIS, &c.

ARTIFICER, a perſon whoſe employment it is to manufacture any kind of commodity, as iron, braſs, wood, wool, linen, &c. ſuch as ſmiths, braziers, carpenters, weavers, ſpinners, &c.

ARTIFICIAL, something made, fashioned, or produced by art, in contradistinction to the productions of nature.

ARTIFICIAL	*Day.*	See the article	DAY.
	Earthquakes.		EARTHQUAKES.
	Eye.		EYE.
	Fire.		FIRE.
	Fireworks.		FIREWORKS.
	Flying.		FLYING.
	Fountain.		FOUNTAIN.
	Globe.		GLOBE.
	Horizon.		HORIZON.
	Lines.		LINES.
	Numbers.		NUMBERS.
	Rainbow.		RAINBOW.
	Vortex.		VORTEX.

ARTILLERY, the general name for all sorts of large fire-arms, or the engines used in war since the invention of gun-powder, as cannon, mortars, bombs, petards, musquets, carabines, &c. See CANNON, MORTAR, &c.

The first pieces of artillery were of a very clumsy inconvenient shape, being usually framed of several pieces of iron fitted together lengthwise, and then hooped with iron-rings; and as they were used for throwing stones of a prodigious weight, in imitation of the antient machines, to which they succeeded, they were of an enormous bore. But the difficulty of conducting and managing these pieces, and the discovery, that iron bullets of much less weight, impelled by better powder, were more efficacious, soon introduced the present matter and fabric of cannon.

The term ARTILLERY is also applied to the ancient instruments of war, as the catapulta, battering-ram, &c.

Train of ARTILLERY, a certain number of pieces of ordnance, mounted on carriages, with all their furniture, and every thing necessary for marching; it is divided into brigades; each brigade generally consists of eight or ten pieces of cannon, with all the machinery belonging to them, and officers to conduct them. When the artillery marches with the army, the military-chest is placed at the head of the train.

There are also a number of pioneers, proportioned to the repairs the roads are supposed to require, who march after the first battalion of the royal artillery, and are under the direction of a skilful officer, in capacity of their commander.

The heaviest brigade, or that which is composed of the heaviest cannon, marches in the center; so that, if there are six light brigades, three march behind and three before this heavy brigade, which is sometimes called the *park-brigade*.

All the brigades, except the park-brigade, change places, and are alternately at the head and in the rear, that the fatigue of each post may be equally divided.

The provincial commissaries march at the heads of their brigades, and see that the officers appointed to conduct them preserve the order of the march, and do not quit their post till the brigade arrives at the place intended, called the park.

ARTILLERY-*Park*, is the place appointed by the general of the army to lodge the train of artillery; the ammunition is disposed in the same order as the battalions of the royal artillery, appointed for its defence and service.

The figure of the park of artillery is that of a parallelogram, if the situation of the ground does not make another form necessary.

Some commandants place the pieces of the first line first, and next to these the waggons containing the ammunition intended for the service of these pieces; and afterwards arrange the pieces of the second line in the same manner, forming the first line with one half of the artillery, and the second with the other. These gentlemen are of opinion that the park may be divided in this order with less confusion than any other method: others think that by placing all the cannon in the first rank, and the proper ammunition behind each brigade, the park is raised; i. e. the artillery renews its march with as much ease and better effect.

The pieces of cannon and carts ought always to be two paces distant from each other, the brigades five paces, and the lines forty paces: when there are pontoons in the train, they form the last rank, and are forty paces behind the preceding.

The park-guard consists of fifty men, draughted from the battalions of the royal artillery, who are posted over-against the park, at the distance of forty or fifty paces from the front: from these also the centinels of the park are draughted, two of which are posted at each rank, sword inhand, without fire-arms.

The battalions of the royal artillery are placed at the right and left of the park, and the carriage-horses about three hundred paces distant, in a commodious place on the right or left, where they may be out of danger.

When the army is encamped in form in a field, or open place, the artillery is placed over-against the center of the first line, formed by the troops, at the distance of three or four hundred paces from the front of this line, if the ground will permit; otherwise, it is placed at the distance of two or three hundred paces behind the center of the second line.

About one hundred paces before the park, are planted three advanced pieces of cannon, charged and ready to be fired, which are called *alarm-pieces*, because they are used to call in on a sudden the troops which are foraging, when there is a necessity for so doing, and to give the alarm for the whole army

army to put itself under arms; or for any other purpose to which the general thinks proper to appoint them. A cannoneer is always posted near these pieces with a match ready lighted.

ARTILLERY-*Company*, a band of infantry, consisting of six hundred men, making part of the militia, or city-guard of London.

ARTIST, a person skilled in some art.

ARTOTYRITES, in ecclesiastical history, a sect who, in celebrating the holy sacrament, made use of cheese as well as bread; or, perhaps, bread baked with cheese: and hence came their name, which is compounded of the Greek words ἄρτος, bread, and τυρος, cheese.

They are a branch of the ancient Montanists, who first appeared in the second century, and infected all Galatia. They admitted women into the priesthood, and into the episcopacy; and Epiphanius tells us that it was no uncommon thing to see a body of seven girls enter their church, dressed in white, with each a torch in her hand, where, like so many Magdalens, they beat their breasts, and bewailed the wretchedness of human nature, and the miseries and iniquity of the world.

ARVAL BROTHERS, *Arvales fratres*, in antiquity, a college of twelve priests, instituted by Romulus, who presided over the ambervalia, or sacrifices, annually offered to Bacchus and Ceres.

The word is Latin, and derived from *arvum*, a field; because they offered sacrifices for the fertility of the field.

Fulgentius has given us the following account of their original: "The nurse of Romulus, called "Laurentia, had a custom of offering a sacrifice "annually to the gods for obtaining a plentiful "crop; and in these religious exercises she was "accompanied with her twelve children. But one "of them happening to die, Romulus, in complai-"sance to his nurse, assisted himself to complete "the original number, and gave them the title of "the twelve arval brothers, which they kept ever "after."

They held their assemblies in the temple of Concord, and wore on their heads a crown composed of the ears of corn, tied together with a white ribbon. Some add, that they were entrusted with the authority of determining the limits of lands and inheritances.

ARUM, wake-robin, or cuckow-pint, in botany, a genus of gnandrious plants, producing a flower with a large monophyllous oblong spatha, or sheath, including a pistil, which is shorter than the spatha: it is destitute of petals, style, and filaments, but hath many four-cornered anthera, adhering to a number of germen, with double rows of hairs between them, which are affixed to the pistil; each germen afterwards turns to a roundish unilocular berry, containing several seeds of the same shape. There are a considerable number of species contained in this genus, especially as Linnæus has classed the aristarum and dracunculus of Tournefort, and the colocasia of Boerhaave with the arum.

The common arum, which is a low perennial plant, and grows wild under hedges, and by the sides of banks in many parts of England, sends forth in March three or four smooth leaves, which are spear-shaped and triangular; these are succeeded by a naked stalk, bearing a purplish pistil, inclosed in a long sheath, which is followed in July by a bunch of red berries. The root is regularly roundish, about an inch thick, brownish on the outside, and white within. There are two varieties of this sort; one with plain leaves, and the other hath leaves full of black spots; the roots of the last are supposed to be most efficacious, and are therefore ordered by the College of Physicians. The arum roots are most violently pungent and acrimonious; insomuch, that the least touch of its juice on the tongue is scarce tolerable, and almost caustic, producing at the same time a considerable thirst. These uneasy sensations are somewhat alleviated by milk, butter, or oils: the other parts of the plant are likewise acrid, though rather less so than the roots. This quality makes it recommended in all viscidities, and in phlegmatic, and scorbutic cases; because it penetrates and rarefies tough concretions and infarctions of the glands and capillary vessels: it hath been prescribed in humoural asthmas and obstructions of the bronchia; for, by the great force and activity of its parts, it breaks through and wears away those little stoppages in the extremities and cutaneous glands, which occasion itchings and scabs; it is therefore justly ranked amongst the most powerful antiscorbutics. Some have affirmed a dram of this root fresh powdered and taken in any proper vehicle, to be a most excellent remedy against poison, the plague, or any pestilential disorder. A cataplasm of this root fresh bruised and mixed with cow-dung, is reckoned very efficacious in arthritic pains, by applying it hot to the part affected. Such a composition cannot but do all that may be expected from the most penetrating substances. This root loses much of its acrimony, by being dried to become pulverable: if kept for some time it seems, on first chewing, to be an inspissated farinaceous substance; it still, however, retains a kind of latent pungency, so as, when chewed long in any considerable quantity, to produce a sensation, as of a slight excoriation of the tongue. These roots are generally gathered in the spring, when the leaves are in full vigour: by taking them up that time of the year they soon lose their pungency; but if they are taken in autumn, when their leaves are decayed, they will retain their quality perhaps a year, or more, at which time, when fresh, they yield on expression a milky juice, about a sixth part of its weight, which, on standing, deposited a white fecula, and became clear; the clear liquor was insipid

ſipid, the fecula was conſiderably pungent, but like the root in ſubſtance, loſes its pungency on being dried: the freſh and the moderately dried roots were digeſted in water, in wine, in proof ſpirit, and rectified ſpirit, with and without heat; the liquors received no colour, and little or no taſte in diſtillation; neither ſpirit nor water brought over any ſenſible impregnation from the arum. The watery and ſpirituous extracts alſo were nearly inſipid; the root, nevertheleſs, loſes in theſe operations almoſt the whole of its pungency. By beating the freſh roots with gummy reſins, and making the mixture into frills, its virtue might be better preſerved than in the form of powder; the proportions of the gums in theſe compoſitions may be very conſiderable, two or three grains of the arum being a ſufficient doſe. It likewiſe preſerves its acrimony unabated for ſeveral months, if beaten with ſugar into a conſerve, its virtue ſeeming to be retained as long as its native aqueous humidity. Though ſpirituous liquors are incapable of diſſolving or extracting the active matter of the arum; they ſeem nevertheleſs, when given along with the dried root, as a vehicle to promote its action. Juncker obſerves, that a drachm of the powder taken with a ſpoonful of brandy, procures a very copious ſweat, even in perſons little diſpoſed to that evacuation, while the powder by itſelf has no ſuch effect. Moſt of the other ſpecies of arum being natives of the hot countries, they therefore require a ſtove in this climate.

ARUM *Æthiopicum*. See CALLA.

ARUM *Scandens*. See DRACONTIUM.

ARUNDELIAN *Marbles*. See MARBLE.

ARUNDO. See REED.

ARUNDO *Saccharifera*. See SACCHARUM and SUGAR.

ARUSPICES, in antiquity, an order of prieſts among the Romans, that pretended to foretel future events, by inſpecting the intrails of beaſts killed in ſacrifices.

The word is Latin, and derived from *aſpicio*, to view.

The aruſpices were conſulted on occaſion of all portents and prodigies. Women were admitted into this order.

ARYTÆNOIDES, in anatomy, the name of the third and fourth cartilages of the larynx. See LARYNX.

The word is formed from the Greek, ἀρυτὰινα, an ewer, and εἶδος, reſemblance, they being thought to reſemble an ewer in ſhape.

ARYTÆNOIDEUS, in anatomy, one of the muſcles that cloſes the larynx, having its head inſerted in one arytænoid cartilage, and its tail in the other; ſerving at once to draw them together, and ſhut the rima, or glottis.

ARYTHMUS, among phyſicians, implies the want of a juſt modulation in the pulſe; and is oppoſed to eurythmus, or a pulſe modulated according to nature.

The word is Greek, ἀρυθμὸς, and compounded, of ἀ, priv. and ῥυθμὸς, meaſure.

AS in antiquity, a particular weight, among the Romans, conſiſting of twelve ounces, and was the ſame with what they called libra, or a pound.

As was alſo the name of a Roman coin, which was of different weights and different matter in different ages of the commonwealth.

Euſebius tells us, that, under Numa Pompilius, the Roman money was either of wood, leather, or ſhells. In the time of Tullus Hoſtilius it was of braſs, and called *as*, *libra*, *libella*, or *pondo*; becauſe actually weighing a pound, or twelve ounces.

Four hundred and twenty years after, the firſt Punic war having exhauſted the treaſury, they reduced the *as* to two ounces. In the ſecond Punic war, Hannibal preſſing very hard upon them, they reduced the *as* to half its weight, viz. to one ounce. And laſtly, by the Papirian law, they took away half an ounce more, and conſequently reduced the *as* to the diminutive weight of half an ounce: and it is generally thought that it continued the ſame during the commonwealth, and even till the reign of Veſpaſian. The *as* therefore was of four different weights in the commonwealth. Its original ſtamp was that of a ſheep, ox, or ſow. But from the time of the emperors, it had on one ſide a Janus with two faces, and on the reverſe, the roſtrum, or prow of a ſhip.

As was alſo uſed to denote any integer or whole; and hence the Engliſh word *ace*.

ASA, or ASSA, in the materia medica, an epithet applied to two very different ſubſtances, called aſa-dulcis, and aſa-fœtida.

ASA-DULCIS is the ſame with benzoin. See the article BENZOIN.

ASA-FOETIDA is a kind of gum, of a very offenſive ſmell, produced by a plant common in ſome parts of Perſia.

The plant which produces it is one of the pentandria digynia of Linnæus, and one of the herbæ umbelliferæ ſemine foliaceo, ſeu ala foliacea cincto of Ray. We had a multitude of various and falſe accounts of it for a long time; Garcias telling us it had leaves like the hazel; and Bontius making two plants of it, one like a willow, and the other with a root like a turnip; ſome have given it leaves like the fig-tree, ſome like thoſe of rice, and others have made it a ſhrub of the phylleræ kind. Kæmpfer is the author to whom we owe the true account of it. This is given in his Amœnitates Exoticæ, where he deſcribes it fully and accurately, under the name of umbellifera leviſtico affinis foliis inſtar præoniæ ramoſis, caule pleno maximo, ſemine foliaceo nudo ſolitario brancæ urſinæ ſive paſtinachæ ſimili radice aſam fœtidam fundente. The Perſians call both the plant and the juice hingeſch;

and the Indians, hiing; but the more accurate in both countries call the plant hingeſch, and the juice or gum, hiing.

The root of this plant is perennial, and very large. It is covered with a thick black rind, which eaſily comes off from the reſt, when freſh. Within it is perfectly white, and full of white, milky, and ſtinking juice, which, when collected and dried, is what the Perſians call hiing, and the Europeans aſa-fœtida. The top of this root is furniſhed with a large tuft of hairy or filamentous matter, like that on the crown of the meum or ſpignel. The leaves are very large, and like thoſe of the piony.

The ſtalk is as thick as a man's arm, and grows to eight or nine feet high. It gradually becomes taper toward the top, whence it is divided into a ſmall number of branches. The leaves ſtand alternately on theſe ſtalks, and that at no great diſtances from one another. The flowers are ſmall, and diſpoſed in umbels. The ſeeds are flattiſh and ſtriated, and of an oval figure; they have ſomewhat of the aſa-fœtida ſmell, but much leſs than might be expected. It grows in Perſia, but there only in two places, at leaſt in thoſe only in any great plenty. Theſe are the mountains about Heraat, and the province of Laar. In theſe places it abounds with juice, and yields the gum in great plenty; when found elſewhere, it yields very little. The leaves in theſe places are of a horrible offenſive ſmell, and no animal will touch them: but the people of the town of Diſguum affirm, that, in the country beyond them, the plant loſes much of its bad ſmell, and that the goats feed very greedily on the leaves, and grow fat upon the diet. Some have pretended to diſtinguiſh two ſpecies of this plant, the one yielding a ſmaller quantity of juice, and that of a leſs fetid ſmell; the other yielding more of it, and that more ſtinking: but Kempfer, who was upon the ſpot, declares the plants to be the ſame, and all the difference to be in the ſoil that produces them. If what the Perſians of Diſguum ſay be true, however, it very well accounts for the difference of the Cyrenaic and Perſian kinds of ſilphium; for the plant in the firſt of theſe places, might be as mild as beyond Diſguum, or even more ſo.

It is very ſingular in this plant, that it ſeldom flowers, ſometimes not till its twentieth, thirtieth, or even fortieth year. During all this time the root is increaſing in ſize, and, conſequently, it ſometimes grows to an enormous bulk: roots of it have been ſeen of the thickneſs of a man's thigh, and of a yard and a half in length: thoſe of the thickneſs of one's arm are frequent. When it ſends forth a ſtalk, and has ripened its ſeed, it periſhes. The ancients made a diſtinction in their ſilphium, as it was produced from the ſtalk, or from the root of the plant; but, at this time, all that we have is obtained from the root. They never make inciſions in roots of leſs than four or five years ſtanding; and they always find, that, the older and larger the root, the more plentifully the juice flows.

The gum or juice, as it flows from the root, is white, and perfectly reſembles cream, and has no viſcidity: on the contact of the air it dries and hardens, and becomes viſcous and coloured. The moſt ſtrongly ſcented aſa-fœtida is always eſteemed the beſt; and Kæmpfer obſerves, that it is much ſtronger, when freſh, than when kept and imported into Europe; that a drachm of it has more ſcent than an hundred weight of what our druggiſts keep.

The leaves of the plant appear in autumn, and continue green the whole winter; in ſpring they wither. About the end of April, when their leaves are in their decaying ſtate, the Perſians aſcend the mountains in ſearch of the plants. They clear away the earth about the root for ſix or ſeven inches deep; they then twiſt off the leaves, and the fibrous ſubſtance at the top of the root. They next earth up the root again to its top, which is now perfectly bare; and this they cover with a bundle of weeds, to keep off the heat of the ſun, which would otherwiſe deſtroy it. They lay a ſtone over all this to keep it firm, that the wind may not blow it off; and in this condition they leave the root for a month or ſix weeks. At the end of this time, they take off the covering, clear away the earth a little from the crown of the root, and, with a ſharp knife, cut it tranſverſely off, taking off about an inch, or a little more, of the top. They then cover this wounded root with the weeds again, making them ſtand hollow from the wounded part, and thus leave them for two days; at the end of which time they return, and find the top of the root, where they had cut it off, covered with exſudated juice, or aſa-fœtida: this they collect, and put up in proper veſſels; and, clearing away the earth a little lower, they cut off another ſlice from the top of the root, but this not thicker than a crown-piece, and cover it up again for another gathering. As they take a large compaſs of ground for their ſearch, they are kept in conſtant employment; the roots of the firſt day's cutting being ready for their taking the gum from, by that time they have cut the more diſtant ones, which they are regularly to return to afterwards. After they have gone through this ſecond operation with all the roots, and collected the ſecond quantity of gum from them, they cover them up for eight or ten days; and, after having ſpread their gum in the ſun to harden it, they carry it home. Four or five men generally go out in a company, on theſe expeditions; and it is a common thing for them to bring home 50lb. weight of it from this firſt gathering; this, however, is eſteemed but an inferior kind of aſa-fœtida; after the roots have remained covered for eight or ten days, they viſit them again, take off the covering of the weeds, and collect the gum. They then cut off another ſlice of the root, and af-

ter

ter that another, and then a third; this is done at the distance of two days between each operation, and the earth is every time cleared away to a proper depth, and the whole process managed as before.

After the third collection in this second expedition, they cover up the roots again, and return home with their stores, leaving them covered for three days. After this, they return to their work, and cut them again three several times at the same distances of time; and, after the third collection of this last expedition, they leave them to perish; for they never recover this terrible operation. *Kæmp. Amœn. Exot.*

Asa-fœtida is composed of a gummy and resinous substance, the first in the largest quantity. Its smell and taste reside in the resin; which is readily dissolved and extracted by pure spirit, and the greater part with the gummy matter by water. It is by much the strongest of the deobstruent warm fetid gums; and is given not only against hysterical complaints, flatulent cholics, and obstructions of the breast, but in most nervous disorders, in which it frequently acts as an antispasmodic, and an anodyne: in some cases musk, and in others opium, are usefully joined with it. Hoffman recommends it as one of the most powerful anthelmintics hitherto known. It is most commodiously taken in the form of pills, from a few grains to a scruple, or half a drachm. It loses both its smell and strength with age; a circumstance necessary to be attended to in proportioning the doses necessary to be given in order to procure the intended effect.

ASAPPES, or AZAPES, an order of soldiers in the Turkish army, whom they always expose to the first shock of the enemy.

The word is derived from *saph*, a word in the Turkish language signifying rank, file, or order.

ASARUM, asarabacca, in botany, a low plant without stalks: the leaves are stiff, roundish, with two little ears at the bottom, somewhat resembling a kidney, of a dark shining green colour, somewhat hairy, set on pedicles three or four inches long: the flowers, which rise among the leaves on shorter pedicles, consist of purplish stamina, standing in a darker-coloured cup, and are each followed by a capsule, containing six seeds. It is perennial and ever-green, a native of the southern parts of Europe and the warmer climates, and raised here in gardens. The dried roots have been generally brought from the Levant; those of our own growth being supposed of weaker virtue.

The roots and leaves of asarum have a moderately strong, not very unpleasant smell, something resembling that of valerian or nard; and a nauseous bitterish acrid taste. The roots given in substance, in doses of a scruple or more, prove strongly emetic and cathartic. The leaves have the same effect, but their dose or degree of strength has not been precisely determined; some say they are of more activity than the roots.

Its principal use among us is as an errhine. The root is one of the strongest of the vegetable substances commonly employed in this intention: a grain or two snuffed up the nose, procure a large evacuation of mucus, both from the mouth and nostrils, without provoking sneezing, like the white hellebore root, or discovering any remarkable irritation. Geoffroy relates, that after snuffing up a dose of this errhine, he has observed the salutary discharge to continue for three days successively, and that he has known a paralysis of the mouth and tongue cured by one dose. He recommends this medicine in stubborn disorders of the head, proceeding from viscid matters, in palsies, and in soporific distempers. During its operation the patient must carefully avoid the cold, which is apt to produce pustules, inflammations, and swellings of the face, and sometimes more alarming symptoms. This herb is the principal ingredient in the cephalic, or sternutatory powders of the shops: some take equal parts of dried asarum, and marjoram leaves; others equal parts of the dried leaves of asarum, marjoram, and marum syriacum, and dried lavender flowers. The empyrical herb snuffs have likewise the leaves of asarum for their basis; but often mixed with ingredients of a more dangerous nature.

ASBESTINE, some incombustible body, or that partakes of the nature and properties of asbestos.

ASBESTOS, salamanders wool, in natural history, the same with amianthus. See the article AMIANTHUS.

The word is Greek, and compounded of *α*, priv. and *σβεννυμι*, to extinguish.

ASCARIDES, in medicine, a species of worms, very slender, found in the intestinum rectum, chiefly of children, and frequently voided with the fœces. They often adhere to the fundament, and are sometimes even pendent from it.

The word is Greek, and derived from *ασκαριζω*, to leap; because of their continual motion, which causes an intolerable itching.

ASCENDANT, or ASCENDING *Line*, in genealogy, is understood of ancestors, or such relations as are nearer the root of the family.

ASCENDANT, in astrology, that degree of the equinoctial which is rising above the horizon in the East, at the time of the birth of any person; and by some astrologers is called the angle of the first house.

ASCENDANT, in astronomy, is a term used for such stars as are rising above the horizon in any parallel of declination.

ASCENDENS *Obliquus*, in anatomy. See OBLIQUUS.

ASCEND-

ASCENDING *Latitude* of a planet, is when the latitude of the planet moves towards the North pole.

ASCENDING *Node*, is that point of the planet's orbit, which interſects the ecliptic in the projection, when the planet is moving towards the North. See NODE.

ASCENDING *Signs*, in aſtrology, are thoſe which are ariſing from the nadir, or loweſt part of the heavens to the zenith.

ASCENDING *Veſſels*, in anatomy, thoſe which carry the blood upwards, as the aorta aſcendens, and vena cava aſcendens.

ASCENSION, in a general ſenſe, implies a moving upwards.

ASCENSION, in aſtronomy, is the riſing of any celeſtial object above the horizon.

Right ASCENSION, in aſtronomy, is an arch of the equinoctial contained between the vernal equinox and the meridian, paſſing through the center of the ſun, planet, or ſtar.

The rule for finding the ſun's right-aſcenſion, having his longitude and greateſt declination given, is this:

As radius,
Is to the coſine of the greateſt declination,
So is the tangent of the ſun's longitude,
To the tangent of right aſcenſion required.

The rule for finding the right-aſcenſion of a ſtar, having the longitude and latitude given. Say,

As radius,
Is to the ſine of longitude,
So is the tangent of latitude,
To the tangent of an arc, which call *a*.

Then, if the longitude be in a northern ſign, with north latitude, or in a ſouthern ſign, with ſouth latitude, ſubtract the firſt arc *a* from the obliquity of the ecliptic, for a ſecond arc *b*. Then ſay,

As the ſine of the firſt arc *a*,
Is to the ſine of the ſecond arc *b*,
So is the tangent of longitude,
To the tangent of right-aſcenſion required.

But when the ſtar's longitude and latitude are of different denominations, take the ſum of the firſt found arc *a*, and the obliquity of the ecliptic, for the ſecond arc *b*. Alſo note, when the difference is taken, that if the obliquity of the ecliptic be greater than the firſt arc *a*, the right aſcenſion will be on the contrary ſide of the equinoctial point that the longitude is reckoned from.

The mean right aſcenſion of any ſtar may be readily found in the catalogue of its reſpective conſtellation, by adding or ſubducting the annual variation in right aſcenſion from the right aſcenſion there found, according as the time required is before or after the year 1770: and if you would have the apparent right aſcenſion, apply the equation of aberration to the mean right aſcenſion, and you have the apparent.

EXAMPLE.

Suppoſe the apparent right aſcenſion of α Aquila be required, November the 29th, 1764.

Mean right acenſion from catalogue of Aquila, for the beginning of the year 1770	=	328°	29′ 27″
Annual variation 46″,27, therefore, in 5 years and 32 days, it amounts to	=	0	3 56
Which ſubtracted from the right aſcenſion for 1770, leaves the mean right aſcenſion for the year 1764, on November the 29th	=	328	25 31
Then in the table of aberration under Aquila, and againſt Nov. 26, you find 13″,1; and proportioning for the 3 days, you have 13″,9		0	0 13,9
Which having the negative ſign prefixed, muſt be ſubtracted from the mean right aſcenſion, and you have the apparent right aſcenſion	=	328	25 19,1

To find the apparent right aſcenſion of a planet, by obſerving with a good regulator the time of the tranſit of a ſtar and the planet over the meridian.

RULE.

Find the apparent right aſcenſion of the ſtar, as directed before; then ſubtract the time of the paſſage of the firſt from that of the laſt, and turn the difference in time into degrees, minutes, and ſeconds of a circle; then if the planet paſſed the meridian firſt, ſubtract the difference in time turned into degrees, from the ſtar's apparent right aſcenſion, and the remainder is the planet's right aſcenſion required; but if the planet paſſed the meridian the laſt, then the ſum is the right aſcenſion required.

EXAMPLE.

November the 29th, 1764, at the Royal Obſervatory at Greenwich, α Aquila paſſed the meridian (by a regulator adjuſted to ſiderial time) at 19ʰ 38′ 48″, and the moon paſſed the ſame day, by the ſame regulator, at 22ʰ 14′ 8″; therefore the difference in time is 2ʰ 35′ 20″, which turned into degrees, equals 40° 50′ 0″. The apparent right aſcenſion of α Aquila at the time of its paſſage, is found (as above) to be 328° 25′ 19″,1, therefore adding 40° 50′ 0″, the difference of the times of their tranſits, (becauſe the moon paſſed laſt) we have 369° 15′ 19″,1; which becauſe it exceeds 360°, the whole circle, we muſt ſubtract 360, and the

the remainder is 9° 15′ 19″,1, the apparent right aſcenſion of the moon required.

To find the right aſcenſion of the ſun, planets, ſtars, &c. mechanically on the globe, armillary ſphere, &c. ſee GLOBE, &c.

Oblique ASCENSION, is an arch of the equinoctial, comprehended between the vernal equinox, or point aries, and that point of the equinoctial line which riſes with the planet or ſtar.

When the latitude of the place and declination of the object are of the ſame name, that is, both north, or both ſouth, then the difference between the right aſcenſion and the aſcenſional difference will be the oblique aſcenſion: but when of contrary names, their ſum will be the oblique aſcenſion required. Note, That if the ſum exceeds 360°, the exceſs above is the oblique aſcenſion; and when the aſcenſional difference is greater than the right aſcenſion, add 360° to the right aſcenſion, and then ſubtract the aſcenſional difference therefrom, and the remainder is the oblique aſcenſion required.

ASCENSIONAL *Difference*, in aſtronomy, is the difference between the right and oblique aſcenſion, which is found thus; Having the latitude of the place, and the declination of the planet or ſtar, given,

Say, As the cotangent of latitude,
Is to radius,
So is the tangent of declination,
To the ſine of the aſcenſional difference.

The aſcenſional difference thus found by trigonometry, is always equal the time the ſun riſes before or after 6 o'clock; therefore, if it be turned into time, and added to 6 hours when it riſes before 6 o'clock, or ſubtracted when after 6 o'clock, we ſhall have the length of the ſemi-ſolar day. Note, That if the ſtar or planet have no declination, they can have no aſcenſional difference, becauſe when the ſun or ſtar are in the equinoctial, their oblique aſcenſion and right aſcenſion are the ſame.

ASCENT, in a general ſenſe, implies the motion of a body upwards.

ASCENT *of Fluids*, is particularly underſtood of their riſing above their own level, which is cauſed either by attraction, preſſure, elaſticity of the air, the force of piſtons in pumps, &c. There are various experiments for proving the aſcent of fluids by attraction; thus, if a tube be filled with ſand, or ſifted aſhes, well preſſed together, and one end of it be placed in a veſſel of water, the water will be attracted by the ſand, or aſhes, and riſe to a great height above that in the veſſel. Or if any part of a piece of cap-paper, ſpunge, bread, ſugar, linen, or ſeveral other ſubſtances, be wetted, the water will aſcend or deſcend, and therefore propagate itſelf to the other parts by the power of attraction. This is likewiſe the cauſe of the aſcent of ſpirit of wine, oil, melted tallow, or any other unctuous body into the wick of a candle. Nor is it unreaſonable to think, that this is alſo the cauſe of the aſcent of ſap in trees, and of the various ſecretions of fluids through the glands of animals, and of ſeveral other effects in nature. See ATTRACTION, *Capillary* TUBE, FLUID, &c.

ASCENT *of Vapours*. It cannot be denied, but that the air is at all times more or leſs full of humid particles, as appears by their falling in an exhauſting receiver, producing the halo. It is no leſs certain, that more moiſture will be taken up and imbibed by air in motion, than air at reſt; as is evident from the drying of linen and other things that are wet, much ſooner when there is a gale of wind, than in calm weather. Beſides, Dr. Halley's Experiments related in the Philoſophical Tranſactions, put this matter paſt all doubt.

This gentleman, in order to account for the circulation of vapours, cauſed an experiment to be accurately made by the operator to the Royal Society at Greſham College, whereby the quantity of water raiſed and carried off in vapour from the ſurface of ſtagnate water, in a place as free from ſun and wind as might be, was determined to be exactly eight inches deep or perpendicular in a year. This fell very much ſhort of the quantity of rain found by the French academics to fall in a year at Paris, viz. full nineteen inches perpendicular: and ſhorter ſtill of the obſervations of Mr. Townley; who, at the foot of the Lancaſhire hills, lying in the neighbourhood of the Iriſh ſea, found there fell in a year above forty inches of water perpendicular. So remarkable a difference makes it evident, that the ſun and winds are the principal cauſes of the evaporation of fluids; the one to raiſe the vapour, and the other to carry it off and diſperſe it.

The doctor, in the ſame courſe of obſervations, takes notice of the vapours ſeeming at ſometimes to adhere or hang about the ſurface of the fluids whence they riſe, cloathing them as it were with a fleece of vapouriſh air; at which times the evaporation appeared to be very little, by the ſmall quantity of water then loſt in twenty-four hours: and as this was obſerved to happen commonly when there was very little wind ſtirring, had theſe experiments been made in a place fully expoſed to wind and ſun, the expence of riſing vapour would have been found to compenſate at leaſt the ordinary return of rain for a ſupply, as later experiments have ſufficiently evinced.

And here it may be obſerved, that in ſtill weather, when this fleece of vapouriſh air happens to be lodged in greater quantities near the ſurface of the water, both it and all objects thereon ſeem to be conſiderably raiſed, and even to lie in a level above the land. This can proceed only from the

refraction or bending of the rays of light, coming out of a medium of one degree of denſity into one of another; as may be exemplified at any time by pouring a quantity of fair water into a baſon, which will then ſhew a piece of money, lying at the bottom, to an obſerver, from whom it was before ſcreened by the brims of the veſſel: by this experiment it will, to appearance, be raiſed about one third of the water's depth.

In ſtill and ſultry weather, when the ſun-beams ſeem to act with a great, a general, and an equal force, on both the land and water, the riſe of vapours is then obſerved to be more dull and languid. When they gleam as it were from behind, or through a cloud, and there is ſomething of motion in the air, or a wind abroad, they riſe in greater plenty. And in very hot climates, as Dr. Halley informs us, they mount in ſuch abundance, that in St. Helena, lying in latitude ſixteen degrees ſouth, his glaſſes for obſervation were very often and very ſoon covered with water. And even in hot weather, in our own climate, the dews, which are no other than vapour condenſed, are found ſufficiently copious. Morning and evening, in that ſeaſon of the year when the ſun is not far above the horizon, the riſing of miſts from rivers, pools, and moiſt places, is frequently very viſible, and is generally the forerunner of a ſultry day. As the ſun gains a greater height, the continued riſe of the vapour is indeed not ſo apparent; but as the cauſe of their riſe, viz. the heat, increaſes, there is no room to ſuſpect, but that the effect is ſtill proportionable to it.

It has been matter of diſpute among naturaliſts, how the waters which form the clouds, and which deſcending, often deluge over vaſt tracts of land, come to be exhaled from the earth and ſuſpended in a fluid ſo much lighter than water, as is the air. Some have imagined, that particles of fire, ſeparated from the ſun-beams, adhering to thoſe of water, make together little maſſes of matter lighter than air, and which therefore riſe therein till they come to ſuch a part of the atmoſphere as is ſpecifically, or bulk for bulk of the ſame weight with themſelves; there forming a thin cloud. And they ſuppoſe that rain is produced by the ſeparation of thoſe particles of fire, on occaſions, from them; whereupon they coaleſce, and then deſcend according to their own gravity, in drops of rain or dews.

This hypotheſis, as Dr. Deſaguliers juſtly obſerves in the Philoſophical Tranſactions, is not without objections. As firſt, fire has never yet been proved to be a diſtinct element, or a particular ſubſtance; and the change of weight of bodies in chemical preparations heretofore preſumed to riſe from the adheſion of particles of fire, is proved by Dr. Hales, in his Vegetable Statics, to proceed from the adheſion of particles of air, which he has there ſhewed to be abſorbed by ſome bodies in good quantities, while it has been generated as faſt by others; and that it may even be abſorbed and generated ſucceſſively by the ſame body under different circumſtances. Secondly, Should the abovementioned ſuppoſition be allowed, the fiery particles joined with the watery muſt be of ſome conſiderable bigneſs, and a perſon paſſing through a cloud, in aſcending a hill, muſt be ſenſible of an extraordinary degree of warmth, which does not happen; for the vapour is there found to be really colder than rain itſelf falling at the foot of the hill. Beſides, the manner in which theſe particles of fire might be ſeparated from thoſe of the water, is to be conceived from no phænomena yet obſerved: this theory therefore ſeems to be without foundation.

The ſecond opinion concerning the riſe and ſuſpenſion of vapours is, that though water be ſpecifically many times heavier than air, yet if the ſurface of it be increaſed by greatly diminiſhing the bulk of its particles, it cannot eaſily fall; ſince the weight of each particle is known to diminiſh in proportion to the cube of its diameter; whereas the ſurface to which the air reſiſts, decreaſes only as its ſquare: and this is ſufficiently evident from the floating of duſt, motes, and other light bodies, for a time therein, according as they are more or leſs minute.

This, however, will not explain the matter before us to ſatisfaction; becauſe, though the increaſe of ſurface, the weight continuing the ſame, may in great meaſure hinder or retard the deſcent of very ſmall bodies in the air, on account of its reſiſtance to a ſurface, ſo much in proportion larger than their bulk, as aforeſaid, it will for the ſame reaſon alſo impede their aſcent therein. And 'tis known that the riſing of duſt, &c. in the air, is owing always to ſome outward force or motion apply'd; whereas vapours continue to riſe as well in calm as windy weather, though not in an equal degree; neither do they always fall to the ground, or ſubſide therein, when the wind ceaſes.

The third and moſt received opinion concerning this matter is, that by the action of the ſun on the ſurface of the water, the aqueous particles become formed into ſpherules or bubbles, filled with an aura, a much finer air, or one highly rarefied, which thus becoming ſpecifically lighter than common air, muſt therefore riſe therein by hydroſtatick laws, till ſuch time as they meet with ſuch an air as is bulk for bulk of their own weight.

This ſeems indeed to be the more probable ſuppoſition of the three; but to ſupport it the following queries muſt be anſwered. How comes the aura, or ſubtle air within the bubbles to be at all ſpecifically lighter than that without them; ſince the ſun's rays muſt be admitted to heat the one equally with the other, and to beat with equal ſtrength

on every part of the ſurface? Was it poſſible, that a rarer could be thus ſeparated from the ambient fluid, what ſhould hinder the cold air, which they needs muſt meet with in their aſcent, from reducing theſe bubbles by contracting their contents; juſt as bubbles of ſoaped water commonly are, notwithſtanding their tenacity is much greater than that of common water, when blown up by warm air from the lungs? And again, Was it reaſonable to admit the reſt of the ſuppoſition, a conſiderable difficulty will yet remain, viz. If clouds were thus conſtituted of ſhells of water filled with air, in its own nature elaſtic, why ſhould they not always expand, when the circumjacent air is rarefied; and why not be condenſed, when the weight of the atmoſphere is there increaſed? This muſt be the natural conſequence of this hypotheſis, and the clouds would ſink and riſe in the atmoſphere on every alteration of weight therein, without affording us any rain at all.

The doctor then plauſibly propoſes another, whereby he endeavours to account for the riſe and ſuſpenſion of the vapours in the atmoſphere, from the elaſticity and repellency obſerved in the ſteam of boiling liquors, capable of extruding either air or water from any veſſel; and ſuppoſes the repellency of the particles of vapour to be always in proportion to their degree of heat. Hence he calculates the force of the vapours raiſed, taking with Sir Iſaac Newton, the heat of boiling water at 34 (when the thermometer will ſhew our heat in the ſummer to be 5, in winter 2, and in ſpring and autumn 3 of thoſe parts) and computes the height to which they accordingly muſt riſe, comparing their elaſticity with that of the air; on which heat has a much leſs effect; ſince that degree of heat which will expand water fourteen thouſand times in boiling, will rarefy air only two thirds. He next conſiders the effects the cold found near and above the earth muſt have in condenſing thoſe vapours, and forming the clouds; and thinks that the diſtance they are obſerved to float at from the earth, in the various ſeaſons of the year, correſponds with this theory.

But neither does this ſeem to be abſolutely free from objections. For in diſtillations, the liquor boiling in the ſtill, over a briſk fire, raiſes a great quantity of ſteam into the head, which endeavours to make its way immediately down the ſpiral pipe or worm, uſually ſet in a tub of water, which, being cold when the ſtill begins to work, condenſes the riſing vapour very faſt. As the water next the worm comes to be heated by the continued riſing of the burning ſteam, it condenſes it indeed ſomething ſlower; but yet when this water is become ſo hot, that a man can ſcarce bear his hand in it, it will nevertheleſs continue to condenſe them into a groſſer fluid apace.

Now as the mitigation of the heat of vapour, and the lowering it from that of boiling water is generally attended with this effect, and as very little vapour is raiſed in the ſtill before the liquor actually boils; it may be preſumed, that the repellency of the particles of ſteam, under the degree of a boiling heat, can be but inconſiderable in promoting the riſe of vapours to any great height in the atmoſphere, or of producing the thing propoſed.

Beſides, ſteam of any heat whatever, if it be not ſome how confined, and caught as it were by ſome object near at hand, but being let into the air looſe, like that riſing from a ſeething-pot, or ſlaking lime, as far as we can trace it, that is, ſo long as it continues viſible, does not by its motion ſhew any great diſpoſition or tendency towards riſing ſteadily, briſkly, or the ſhorteſt way, into ſuch part of the atmoſphere as may be of equal gravity therewith: but it rather ſeems vaguely to fly hither and thither, till it can be abſorbed and received by the air, thereby warmed in the ſame manner as the breath from the lungs and other humid vapours are.

It might be alſo ſuſpected, that the repellency which ſhould give the particles of water their firſt riſe into the denſer and circumambient air, would increaſe in air more rare, in their aſcent, and defeat, and by their undue ſeparation prevent their being ever condenſed in rain. Beſides, as the preſſure of the denſer air near the earth is not able to reduce them into ſo cloſe a contact as to form drops of water there, it is not likely that in a rarer medium this ſhould be done with more ſucceſs.

For want therefore of a more perfect theory of this part of our meteorology, we muſt at preſent, in good meaſure, content ourſelves with obſerved facts. And it being evident, that rare and warm air, together with what humid particles it ſhall at any time imbibe (and which from the conſtant heat of the ſun muſt neceſſarily conſtantly be done, and that in very great plenty) will emerge and ſwim in air that's denſe and cold, to ſuch a part of the atmoſphere as is of equal ſpecific gravity therewith: and that whenever, for want of the ſuperincumbent preſſure, a part of its denſity ſhall be loſt, it will let the watery particles fall, and they being collected and aſſembled in good quantity, will at length perhaps form a floating cloud, and become viſible, merely by the reflection of the rays of light, which, falling by various angles thereon, exhibits various colourings, and a multiplicity of forms, to the eye of an obſerver: or if its denſity ſhall continue to be ſtill more diminiſhed, it may be again reſolved into its original water, and become an immediate ſhower of rain.

The ſun ſhining with equal ſtrength on the ſurface both of the land and water, will doubtleſs affect them differently: becauſe a great part of his rays are reflected from the ſolid earth by the ſame angle in which they fall thereon, whereby the air will

will always be more rarefied over this, than over the water, which abſorbs moſt of them, and reflects but few: of conſequence then the light air will mount, and continue to riſe over the land, and the denſe and vaporous air from ſea will croud after it, to make good the deficiency; as in the caſe of the land and ſea-breezes; and hence abundant matter will probably there be collected towards the formation of a cloud. See CLOUD.

ASCETICS, a name given to thoſe who exerciſe an extraordinary degree of piety or virtue: ſuch were the Eſſeni and Phariſees amongſt the Jews, and the Stoics among the Heathens In the primitive times of chriſtianity, it was applied to thoſe who lived a life of more rigid and auſtere ſanctity, continually exerciſing themſelves in the difficult and painful graces of ſelf-denial and mortification, foregoing ſociety, and wearing out their days in ſolitude and devotion. It was afterwards in a great meaſure laid aſide, being ſeldom applied to any, except monks and hermits.

ASCII, in geography, are they who inhabit the torrid zone; becauſe twice every year they have no ſhadow, which is, when the ſun's declination is equal and ſimilar to the latitude of the place.

The word is compounded of the Greek, α, priv. and σκια, a ſhadow.

ASCITES, in medicine, the ſame with dropſy. See DROPSY.

ASCLEPIA, in antiquity, a feſtival of Æſculapius, the god of phyſic; and obſerved particularly at Epidaurus.

ASCLEPIAD, in ancient Greek and Latin poetry, was the name of a particular kind of verſe, which conſiſted of four feet, compoſed of a ſpondee, a choriambus, and two dactyls; or, which is the ſame thing, of a ſpondee, a dactyl, a long ſyllable, and then two more dactyls; as for inſtance,

Terrarum dominos evehit ad deos. HOR.

ASCLEPIAS, ſwallow-wort, in botany, a genus of pentandrious plants; the flower is monopetalous, reflexed, and divided into five parts. In the center is ſituated five nectariums, encompaſſing the generative parts; theſe have horns which turn toward the ſtamina. It hath five filaments, which are ſcarce viſible, topped with the ſame number of antheræ; theſe are ſituated between the nectariums. It hath two oval acuminated germen ſupporting two ſtyles hardly diſcoverable, crowned with little ſtigmas; the germen afterwards becomes two large oblong acuminated pods, opening with two valves in one cell, which is filled with a number of imbricated ſeeds crowned with down. There are various ſpecies of aſclepias; the officinal ſort, called alſo hirundinaria and vincetoxicum, grows naturally in the ſouth of France, Spain, and Italy, and is accounted a great counter-poiſon. The root of this plant is compoſed of many ſtrong fibres, which are connected at the top (like thoſe of aſparagus), from which ariſe many ſtalks in number proportional to the ſize of the roots; theſe grow near two feet high, and are very ſlender at the top. The leaves are oval, ending in a point, and placed oppoſite by pairs. The flowers are white, growing in umbels near the top of the ſtalk, from which are ſent out ſmaller umbels: the flowers appear in June, and the ſeeds ripen in September. Its roots and ſeeds are moſt in uſe, and recommended for their drying and warming qualities, which rank them among the alexipharmics and cephalics; and formerly an extract and a diſtilled water was made from this plant, but in the preſent medical practice it is much in diſuſe. To this genus Linnæus has added ſeveral ſpecies of the apocyorum of Tournefort.

ASCLEPIODOTÆANS, in eccleſiaſtical hiſtory, a ſect of heretics that appeared in the time of the emperor Heliogabalus, and ſo called from their leader Aſclepiodotus, the firſt who taught that Jeſus Chriſt was a mere man.

ASCORDRUTÆ, in eccleſiaſtical hiſtory, a ſect of Chriſtians in the ſecond century, who placed all religion in knowledge, and under pretence of inward and ſpiritual worſhip, rejected every external and corporeal ſymbol.

ASCOLIA, in antiquity, a feſtival celebrated by the Athenian huſbandmen in honour of Bacchus, to whom they ſacrificed a he-goat, becauſe that animal deſtroys the vines.

The word is Greek, and derived from ασκος, a bottle; it being cuſtomary at this feſtival to form the victim's ſkin into a kind of bottle, which was filled with oil and wine, and fell to the ſhare of him who firſt fixed himſelf upon it with one foot.

ASCUS, in natural hiſtory, the pouch, or bag of the opoſſum. See OPOSSUM.

ASELBES, a name given by ſome to the millipedes. See MILLIPEDES.

ASH, *fraxinus*, in botany, a genus of polygamious trees, of which there are ſix ſpecies. The common aſh grows to a tree of a conſiderable ſize. The leaves of this ſort are pinnated, and generally contain four or five pair of lobes or folioles, which are placed oppoſite in pairs, ovated, acuminated, and ſlightly ſerrated at their edges, and are terminated by an odd one, of a dark green colour on the upper ſide and paler underneath. It hath hermaphrodite and female apetalous flowers, which grow at remote diſtances on the ſame tree, and ſometimes on different trees. The hermaphrodite flowers contain two erect filaments, topped with upright oblong quadrifulcar antheræ. In the center is placed an ovated compreſſed germen, ſupporting an upright cylindrical ſtyle, crowned with a bifid ſtigma: the oviary afterwards becomes a ſeed veſſel, containing a membranaceous lanceolated ſeed, ſhaped like

like a bird's tongue; the female flowers are like the male, except wanting the ſtamina. This tree is a very free grower, and is propagated by ſowing the keys (commonly ſo called), that are ripe about the latter end of October or November, at which time they ſhould be gathered from the ſtraighteſt and moſt thriving trees, rejecting thoſe that grow on ſmall or decaying trees; having prepared a bed of freſh earth, which ſhould be well dug and cleanſed from noxious weeds and roots: a ſmall bed will be ſufficient to raiſe a great quantity of trees; the ſeeds ſhould be ſown tolerably thick, and covered about half an inch with earth. Theſe ſeeds many times lay in the ground a year before they come up, eſpecially if they are not ſown till the ſpring; in this caſe the bed ſhould remain undiſturbed, keeping it clean from weeds. When the plants come up, if the weather proves dry, watering them now and then will greatly promote their growth, obſerving not to let any weeds grow amongſt them; if they make good progreſs in the ſeed-bed, they will be fit to tranſplant in the nurſery the ſucceeding autumn, at which time there ſhould be a piece of ground well prepared to receive them. When the leaves begin to fall off, it is the proper time for their removal, which ſhould be done carefully with a ſpade, and not drawn up (as ſome injudiciouſly have practiſed) to the great detriment of the plants. When they are taken up, ſhorten the downright or tap-roots, and plant them about three feet row from row, and about a foot diſtance in the row, well cloſing the earth to their roots. In this nurſery they ſhould remain two or three years, obſerving to trim up the ſide-branches in winter, and dig the ground between the rows, after which time you may remove them where they are to remain for good. Where there are plenty of aſh trees, a ſupply of ſelf-ſown plants may be had, eſpecially in hedges, where they are protected from cattle by buſhes, &c. In ſuch places the plants will come up and thrive; but they ſhould not be ſuffered to grow in hedge-rows, as the aſh robs every plant of its nouriſhment that is within reach of its roots; nor ſhould aſh trees be permitted near paſtures, for if any of the cows eat of the leaves or ſhoots, all the butter which is made of their milk will be rank and of little value. This tree will grow upon almoſt any ſoil; but the better the ſoil is, the more the tree will increaſe in bulk. If they are deſigned for a particular plantation, their proper diſtance may be about eight feet each way, and planted in quincunx order; and after they have been planted a year or two, every other tree may be cut down, reſerving the moſt likely plants. Thoſe which are cut down ſhould be left ſix or eight inches above ground, when they will make ſeveral ſtrong and vigorous ſhoots, which in a few years will be uſeful for making coopers hoops, and divers other purpoſes: the other trees which are left are deſigned for timber, the number of which may be leſſened as the trees advance in magnitude, obſerving to reſerve the moſt promiſing for timber of the largeſt ſize. If a wood of theſe trees are properly managed, it will turn out greatly to the owner's advantage; for by the underwood, which will be fit to cut every ſeven or eight years for the uſes above-mentioned, and the ſtock preſerved for timber, it certainly would be well worth while, where the land is not too dear, to make a plantation of aſh trees. The timber of this tree is excellent for various uſes, as for oars, ploughs, axle-trees, harrows, blocks for pullies, coach-making, wheels, and divers other purpoſes. The beſt ſeaſon for felling the aſh is in December or January, for if it is done either too ſoon in autumn, or too late in the ſpring, the timber will be ſubject to be infeſted with worms and other inſects; but for lopping the pollards the ſpring is to be preferred. The other ſpecies of aſh may be propagated by inoculating them on the common ſort, upon which they will all take very well, and become hardier than upon their own ſtock; but thoſe budded trees never grow ſo large as thoſe raiſed from ſeeds, nor will the ſtock and bud keep pace in their growth, ſo that there will be a conſiderable difference in the ſize of the ſtem, and above the place of inoculation; but as few of the foreign kinds have yet arrived at an age to produce ſeeds in England, the nurſery-gardeners have been obliged to propagate them by budding, unleſs they can procure a ſufficient quantity of ſeeds from the countries they are natives of. The ſeeds of the common aſh are accounted good in the jaundice, pleuriſy, and the ſtone, but in the preſent medical practice are much diſuſed.

ASHES, *cineres*, the earthy particles of wood, coal, and other combuſtible ſubſtances, remaining after they are conſumed by fire. Theſe, if produced from a vegetable, are of a whitiſh colour, and contain a conſiderable quantity of fixt ſalt, blended with the terrene particles, and when boiled with fair water yield a lixivium of an acrimonious alkaline taſte. Aſhes of all kinds contain a very rich fertile ſalt, and are the beſt manure of any for cold wet lands: they are alſo of conſiderable uſe in making lixiviums or lyes for the purpoſes of medicine, bleaching, and for ſugar-works, and are diſtinguiſhed by various names, as *pot-aſhes*, *pearl-aſhes*, &c. which ſee.

ASIATIC, ſomething peculiar to Aſia.

Asiatic *Style*. See Style.

ASIDE, in the drama, ſomething ſaid by an actor, which ſome, or even all the other actors preſent, are ſuppoſed not to hear; a circumſtance juſtly condemned as being unnatural and improbable.

ASINUS, in natural hiſtory, the aſs. See Ass.

ASP, in natural hiſtory, a ſpecies of ſerpents often mentioned by the ancients, but without any

accurate deſcription of it. Some ſay it is of the ſize of a common ſnake, but the back broader; and the neck ſwells greatly when the creature is angry. Some aſſert that their teeth grow exceeding long, and ſtand out of their mouths like thoſe of the boar; but this ſeems to be fabulous. However, it may be true, that two of the longeſt are hollow, and that they are thoſe which contain the venom. They are generally covered with thin pellicles, which ſlide down when the ſerpent bites. The ſkin is ſaid to be covered with ſcales, which are redder than thoſe of any other ſerpent; but others affirm they are of very different colours. Some ſay they are two cubits long, others four, and others again five; Peter Kolben affirms he has ſeen them ſeveral ells in length: ſo that, in ſhort, nothing certain can be known of the aſp. It is undoubtedly a native of Africa: and it was by the bite of one of theſe ſerpents that Cleopatra is ſaid to have ended her days.

Seba gives the name of aſp to ſeveral ſerpents, the firſt of which is ſaid to be found in Egypt, and is ſpotted with black. The ſkin is of a reddiſh aſh-colour, marked with black ſpots; whereas thoſe on the back nearly reſemble eyes. The head is of a dark brown, ſurrounded with a white colour; and the ſcales of the belly are white, adorned with a reddiſh border. He has alſo an American aſp, which nearly reſembles this in every reſpect.

The Java aſp is of a ſea-green, with a ſharp mouth, and a long head covered with ſcales on the fore-parts. The other ſcales are alſo of a ſea-green colour, with white edges, except under the belly, where they are of a light green, and ſeparated from the reſt by two white ſtreaks running like furrows along the ſides.

The Surinam aſp is of a bright green colour, with blackiſh ſpots; but the belly is of an aſh-coloured red, and the head is of a deep green; the eyes are lively, and the tail is terminated with ſharp points. *Brooke's Natural Hiſtory.*

ASPALATHUM. See LIGNUM RHODIUM.

ASPALATHUS, African broom, in botany, a genus of plants bearing papilionaceous flowers, with obtuſe moon-ſhaped wings, containing ten ſtamina, with a ſingle ſtyle; the oviary becomes an oblong pod, containing one or two reniform ſeeds. There are three ſpecies in this genus, which are all natives of the country about the Cape of Good-Hope.

ASPARAGUS, in botany, a genus of ſarmentaceous plants, whoſe flower is roſaceous, compoſed of ſix petals, which ſpread open, and are reflexed at the top, and containing ſix filiform filaments topped with roundiſh antheræ: from the center of the flower ariſeth the piſtil, which afterwards becomes a ſoft, round, red berry, of three cells, in each of which are lodged one or two ſeeds.

There are ſeveral ſpecies of aſparagus, but the ſort which is beſt known is the common aſparagus, of which great quantities are raiſed to ſupply the London markets, for at leaſt half the year. The garden-aſparagus is propagated by ſowing its ſeeds; in the choice of which there ſhould be care taken previouſly to mark the buds of an old bed, the largeſt and ſtraighteſt to be reſerved; which buds, when they have branched, may be faſtened to ſtakes to preſerve them from being broken down. Moſt of theſe buds will produce in autumn great quantities of red berries, which ſhould remain on the branches till the ſtalk begins to decay; then ſtrip off the berries into a tub, where they may lie in a heap to ſweat for about three weeks or a month, by which means the outward huſks will be rotten; then fill the tub with water, and break all the huſks by ſqueezing them between your hands: theſe huſks will ſwim upon the water, but the ſeed will ſink to the bottom; ſo that, by pouring the water off gently, the huſks will be carried along with it, and, by putting in freſh water two or three times, and ſtirring it up, the ſeed will be entirely clean; then ſpread the ſeed on a matt, and expoſing it to the ſun and air until it is perfectly dry, it then may be put by, and reſerved till the time of ſowing, which is in February, when a bed of good rich earth muſt be prepared, whereon the ſeed may be ſown, but not too thick; after which tread the ſeed into the ground, and rake it ſmooth over. The ſucceeding ſummer the bed muſt be conſtantly kept clear from weeds; and towards the latter end of October, the haulm ſhould be taken off, and a little rotten dung ſhould be ſpread over the bed to preſerve the young buds from being damaged by froſts, &c.

The roots in the following ſpring will be fit to be planted where they are to remain. A proper piece of ground muſt therefore be prepared, by well trenching it, and burying a large quantity of rotten dung, taking out all large ſtones, &c. which being handſomely levelled, will be fit to receive the plants. The time for planting theſe roots depends on the moiſture or dryneſs of the ſoil, ſo as to make a month's difference. If very dry, plant in the beginning of March; but if wet land, it is better to defer the planting till April; about which time the plants are beginning to ſhoot. The ſeaſon being come, the roots ſhould be taken up carefully with a three-pronged fork, commonly called an aſparagus-fork, ſhaking them out of the earth, and ſeparating them from each other, obſerving to lay their heads even for the more convenient planting them, which muſt be done in the following manner: The plot of ground being levelled, begin at one ſide thereof, ranging a line very tight acroſs the piece, which will be a direction to cut a ſtraight trench about ſix inches deep, in which the roots are to be placed, ſpeading them with the fingers, and ſetting the buds upright, ſo as to be about two inches below the ſurface of the ground, and twelve

twelve inches asunder; then fill up the trench and smooth the surface; then remove the line a foot farther back, and make a trench in like manner, laying the plants therein as before-directed, and continuing the same distance from row to row till the whole is finished, observing between every four rows to leave the distance of three feet for an alley to go between the beds to cut the asparagus, earthing them up, &c.

The plot being finished and levelled, a small crop of onions is generally sown on it, which hurts but little the asparagus. Another method is sowing the seeds where the plants are to stand for good, which is, instead of planting the roots, as before directed, to make holes at a foot distance and drop two seeds in each; these holes should not be above half an inch deep; then cover the seeds, and so continue on from row to row at the same distance as in planting the roots, if it is designed to stand for the natural season of cutting; but if it is to be taken up for hot-beds, there may be six rows planted in each bed, and the distance in the rows need not be more than nine inches. This should be performed in February, because the seeds lie long in the ground. As the roots of asparagus always send forth many long fibres which run deep in the ground, so when the seeds are sown where they are to remain, these roots will not be broken or injured as those must which are transplanted; therefore they will shoot deeper into the ground, and make much greater progress, and the fibres will shoot out on every side, which will cause the crown of the root to be in the center; whereas, in transplanting, the roots are made flat against the side of the trench. When the asparagus is come up, the onions should be hoed: but this method must be done in dry weather, that the weeds may die as fast as they are cut up. This work must be repeated about three times, which, if well done, and the season not too wet, will keep the ground clear from weeds until the onions are fit to be pulled up, which is commonly in August. When the onions are drawn off, the ground must be cleared, except the asparagus haulm, which should remain till it decays. This haulm should be cut off with a knife, leaving the stems two or three inches above ground, which will be a guide to distinguish the beds from the alleys: then with a hoe clear off the weeds into the alleys, which dig up, burying the weeds in the bottom, and throw the earth on the beds, so that the beds may be about five inches above the level of the alleys. In this manner it may remain till spring, when the beds must be hoed over to destroy the young weeds. In the following autumn dig up the alley again, as was before directed, earthing the beds rather thicker. The third spring after planting, some of the asparagus may be cut for use; therefore, when the buds are preparing to shoot above ground, the beds should be stirred up with a fork made purposely, observing not to go too deep, lest the head of the root is wounded; then rake the bed smooth, which will destroy the young weeds. When the buds appear about three or four inches above ground, they may then be cut for use: but it should be done sparingly, only taking the large buds, and suffering the small to run up, which is absolutely necessary for the future welfare of the roots.

The manner of dressing asparagus beds is every year the same, viz. Keeping them from weeds, digging the alleys in October or November, and forking the beds in the spring, &c. only observe every other year to lay a little rotten dung all over the beds, and burying some in the alleys, also, at the time of digging them up; this will preserve the ground in good heart to maintain the roots with vigour: and by this management a plot of good asparagus may be continued for ten or twelve years in cutting, and will produce good buds. The alleys being proposed three feet, which is wider than is commonly practised, a crop of beans may be raised in each without prejudicing the roots of the asparagus; and by the beds they will be protected from the cutting winds in the spring.

Asparagus, by being planted about six weeks on a hot-bed (well prepared) before it is wanted, will produce very good crops; and by having a succession of these beds, asparagus may be raised for the table all the winter. The buds of this plant are extremely diuretic, which is discoverable by the smell of the urine; but the roots are yet more so, because they have more of the salt from whence they derive that quality, than any part which grows above ground; to which it cannot rise in such plenty, as the root itself receives it from the earth: and this may pass for a reason why most roots are more endued with this property than their plants. This is deservedly reckoned one of the five opening roots, and is good in all compositions intended to cleanse the viscera; especially where obstructions threaten the jaundice or dropsy. There are several sorts of asparagus, two of which are wild. One is distinguished by C. Bauhine, *sylvestris tenuissimo folio*, which grows about Montpellier in France, differing little from the garden sort; the other, *petræa et corruda foliis acutis*, growing in some parts of Italy; the tops of which are eaten as ours here, having also ascribed to them the same virtues.

ASPECT, among gardeners, signifies the same with exposure. See the article EXPOSURE.

The word is formed from the Latin, *aspectus*, which is derived from *aspicio*, to view.

ASPECT, in astronomy, signifies the situation that each planet or star bears to another, and is usually divided into five by astronomers in almanacks, &c. The first is called Sextile, and marked thus ✶, signifying that the planets or stars are 60 degrees distant from each other. The second is called

is much ſlower, and he is ſooner tired. The aſs brays in a very diſagreeable manner; the ſhe-aſs has a more ſhrill and piercing cry.

Of all animals that are covered with hair, the aſs is leaſt ſubject to vermin; which may perhaps proceed from the hardneſs and dryneſs of his ſkin; and for the ſame reaſon, he is leſs ſenſible of the ſtrokes of a whip, and the ſtinging of flies, than a horſe. The teeth fall out, and grow at the ſame age, and in the ſame manner as in a horſe, and he has the ſame marks in his mouth. Aſſes generally breed in May and June, and in the tenth month the milk appears in the dugs of the female; but ſhe does not foal till the twelfth month; ſeven days after which, ſhe is ready for the male again. She always brings forth one at a time; at leaſt there are few inſtances to the contrary.

The aſs, like the horſe, is three or four years in growing, and will live till twenty-five or thirty. They ſleep much leſs than a horſe, and never lie down for that purpoſe, unleſs they are very much tired. In general, they have much better health than a horſe, and are ſubject to fewer diſeaſes.

Travellers inform us, that there are two ſorts of aſſes in Perſia, one of which is uſed for burdens, they being ſlow and heavy; and the other, kept like horſes, for the ſaddle; for they have ſmooth hair, carry their heads well, and are much quicker in their motion; but when they ride them, they ſit nearer their buttocks than when on a horſe. They are dreſſed like horſes, and are taught to amble like them; but they generally ſlit their noſtrils to give them more room for breathing. Dr. Ruſſel likewiſe tells us, they have two ſorts in Syria, one of which is like ours, and the other very large, with remarkable long ears; but they are both put to the ſame uſe, that of carrying burdens.

The onager, or wild-aſs, has been, by ſome authors, confounded with the zebra, but very improperly, the latter being a diſtinct ſpecies; for the onager is not ſtreaked like the zebra, nor is his ſhape ſo beautiful. Some have alſo been of opinion, that the wild aſs is not a diſtinct animal from the common aſs; but all judicious travellers that have taken notice of them, affirm the contrary. They are ſaid to be very ſwift; and when they ſee a man, will make a bound, and immediately fly away: ſo that the only method of taking them, is by traps and gins. They have much the ſame ſhape as common aſſes, but are of a brighter colour, and a white liſt runs from the head to the tail. Of the hide of theſe aſſes, and particularly of that part next the rump, they make that excellent leather which we call ſhagreen, and which is put to ſo many curious uſes.

Asses *Milk*, the milk of the animal deſcribed in the preceding article; and greatly eſteemed in conſumptions, &c.

ASSA Dulcis, and Foetida. See Asa.

ASSARON, or Omer, a meaſure of capacity, in uſe among the Hebrews, containing five pints.

ASSART, *Aſſertum*, in law, an offence committed in a foreſt, by pulling up the trees by the roots.

This is a greater treſpaſs than waſte; though a perſon may ſue out a licence to aſſart ground in a foreſt; that is, to render it arable: and hence ſome diſtricts are called aſſarted lands; and formerly the owners paid aſſart rents to the crown for them.

ASSASSIN, a perſon who kills another ſecretly, or by attacking his enemy unprepared. It is alſo applied to a perſon who, for the ſake of ſome ſtipulated reward, undertakes to murder a perſon to whom he is a ſtranger, in order to revenge the quarrel of another.

ASSAULT, in law, a violent injury offered to a man's perſon, being of a higher nature than battery; for it may be committed by offering a blow, or pronouncing a terrifying ſpeech.

Thus, in caſe a perſon threatens to beat another, or lies in wait to do it, if the other is hindered in his buſineſs, and receives loſs, it will be an aſſault for which an action may be brought, and damages recovered.

Not only ſtriking, but thruſting, puſhing, throwing ſtones, or even drink in the face of any perſon, are deemed aſſaults. But in all theſe caſes, a man may plead in his juſtification the defence of his perſon or goods, father, mother, wife, maſter, &c.

Assault, in the military art, implies a furious effort made to carry a fortified poſt, camp, or fortreſs, wherein the aſſailants do not ſcreen themſelves behind any works: while the aſſault laſts, the batteries ceaſe firing for fear of killing their own men.

ASSAY, in metallurgy, the trial of the goodneſs and purity of metals and metallic ſubſtances.

Assay *Oven*, or *Docimaſtical Furnace*, a furnace uſed in aſſaying metals.

It is conſtructed in the following manner: 1. Make with iron plates, a hollow quadrangular priſm, H, H, (Plate XII. *fig.* 2.) eleven inches broad, and nine inches high, ending at the top in a hollow quadrangular pyramid I, ſeven inches high, and terminating in an aperture ſeven inches ſquare. But this priſm muſt be cloſed at the bottom with an iron plate A, which ſerves as a baſis. 2. Near the bottom make a door A, three inches high, and five inches broad, leading to the aſh-hole. 3. Above this, and about ſix inches from the baſe, make another door C, forming the ſegment of a circle, four inches broad at its baſis, and three inches and a half high in the middle. 4. Faſten three iron plates H, H, H, on the fore

part

part of the furnace; let the lowermoſt of theſe plates, which is eleven inches long, and half an inch broad, be faſtened with rivets to the bottom and fore part of the furnace, in ſuch a manner, that there may be a groove ſo wide, between the upper edge of the ſaid plate, and the ſide of the furnace, that the ſliders B, B, of the lower door, may be moved eaſily backwards and forwards therein, by means of the handles O, O: theſe ſliders muſt be made of a thicker iron plate than the other parts of the furnace. The ſecond iron plate muſt be alſo faſtened with rivets in the ſpace between the two doors, and directly parallel to the former, in ſuch a manner, that both the upper and lower edge of it may form a hollow groove with the ſide of the furnace. The lower of theſe grooves ſerves to receive the upper edges of the ſliders B, B, that ſhut the lower door: the upper groove is to receive the inferior edges of the ſliders D, D, belonging to the door C. The third plate, which is like the firſt, muſt be riveted cloſe above the upper door, in ſuch a manner, that its lower ſide may form a groove with the ſide of the furnace. 5. Make two ſliders D, D, to ſlide in the above grooves, by means of the handles O, O. In theſe ſliders muſt be two holes near the top; the one, marked E, muſt be about one fifth of an inch broad, and one inch and a half long; the other, marked F, a circular aperture one inch high, and two inches broad. 5. Let five round holes one inch in diameter be bored in the furnace, two in the fore part marked G, G, and two in the back part, all at the height of five inches from the bottom, and each of them three inches and a half from the neareſt ſide of the furnace: and a fifth hole K, at the height of one inch above the top of the upper door C. 7. Let the inſide of the furnace be furniſhed with iron hooks, about three inches from each other, and projecting about half an inch, in order to faſten the lute, with which the inſide of the furnace muſt be covered. 9. Let a moveable hollow quadrangular pyramid M, three inches high, be fitted to the upper aperture L, of the furnace; ſeven inches broad at the baſe, and terminating at top in a circular tube N, three inches in diameter, two inches high, and the upper diameter ſomewhat leſs than the bottom. This prominent tube ſerves to ſupport a funnel or flue, fitted to it, and compoſed of iron plates, two feet high. This funnel is only neceſſary when a very ſtrong fire is required. The pyramidical cover M, muſt have two handles P, P, faſtened to it, in order to put it on, or take it off, as the operation may require. And to hinder this cover from being eaſily thrown down, let an iron plate be riveted to the right and left ſides of the upper part of the furnace, and turn down towards the inſide, ſo as to form a grove, into which the lateral edges of the cover may enter, and ſlide forwards and backwards at pleaſure. A ſquare ledge of thick iron plate muſt be faſtened to the top of the upper ledge of the lower door A, in order to ſupport the grate and lute. The grate muſt be compoſed of ſmall iron bars, half an inch thick, three fourths of an inch diſtant from each other, and placed edgeways on the ledge. The lute muſt be about three quarters of an inch thick, and compoſed of Windſor loam, or French clay, moiſtened with ox blood diluted with water. In order to perform an operation in this oven, two iron bars an inch thick, and of a proper length, muſt be thruſt through the four holes G, G, above deſcribed, in order to ſupport the muffle introduced through the upper aperture of the furnace.

ASSAYING, the art of diſcovering how much pure metal is contained in any ore; or the proportion of the ſeveral ingredients in any mixed metal. For the methods of aſſaying the ſeveral metals, &c. ſee the articles GOLD, SILVER, LEAD, COPPER, &c.

ASSAYING of weights and meaſures, implies the examining the ſeveral weights and meaſures by the clerk of the market.

ASSAY-MASTER, an officer appointed by certain corporations, to make juſt aſſays of all gold and ſilver brought to him for that purpoſe, and make a true report thereof.

ASSEMBLY, in military affairs, implies the ſecond beating of the drum before a march, on which the ſoldiers ſtrike their tents, roll them up, and ſtand to arms.

ASSENT, *Aſſenſus*, in a general ſenſe, implies an agreement to ſomething propoſed or affirmed by another.

Royal ASSENT, the approbation given by the king to a bill in parliament, after which it becomes a law.

ASSIENTO, in commerce, a contract between the king of Spain and ſome other power for tranſporting negroes into the Spaniſh dominions in America.

The word is Spaniſh, and ſignifies a farm.

ASSIGN, in common law, a perſon to whom a thing is aſſigned or made over.

ASSIGNEE, in law, a perſon appointed by another to do an act, tranſact ſome buſineſs, or enjoy a particular thing.

Aſſignees may be appointed either by deed or by law: by deed, where the leſſee of a farm aſſigns the ſame to another; by law, where the law makes an aſſignee without any appointment of the perſon intitled; as an executor is aſſignee in law to the teſtator, and an adminiſtrator to an inteſtate. But when there is an aſſignee by deed, the aſſignee in law is not allowed.

ASSIGNING, in a general ſenſe, implies the making over the right of one perſon to another. In a particular ſenſe, it ſignifies the pointing out of ſomething, as an error, falſe judgment, or waſte:

waſte: but in theſe caſes it muſt be ſhewn wherein the error is committed, where and how the judgment is unjuſt, and where the waſte is committed.

ASSIGNMENT, in law, the transferring the intereſt one has in a leaſe, or other thing, to another perſon.

ASSISE, in old law books, is defined to be an aſſembly of knights and other ſubſtantial men, together with the juſtice, in a certain place, and at a certain time: but the word in its preſent acceptation, implies a court, place, or time, when and where the writs and proceſſes, whether civil or criminal, are decided by judge and jury.

In this ſenſe, aſſiſe is either general or ſpecial; general, when judges go their reſpective circuits, with commiſſion to take all aſſiſe: ſpecial, when a commiſſion is granted to particular perſons for taking an aſſiſe upon one or two diſſeiſins only.

By magna charta, juſtices ſhall be ſent through every county, once a year, who, with the knights of the ſeveral ſhires, ſhall take aſſiſe of novel diſſeiſin. With regard to the general aſſiſe, all the counties of England are divided into ſix circuits, and two judges are aſſigned by the king's commiſſion to every circuit, who now hold the aſſiſes twice a year, in every county except Middleſex and the counties palatine. Theſe judges have five ſeveral commiſſions. 1. Of oyer and terminer, by which they are empowered to try treaſons, felonies, &c. 2. Of goal-delivery, which empowers them to try every priſoner in goal, be his offence what it will. 3. Of aſſiſe, which gives them authority to do right upon writs, brought by perſons wrongfully thruſt out of their lands and poſſeſſions. 4. Of niſi prius, by which civil cauſes come to an iſſue in the courts at Weſtminſter, are tried in the vacation by a jury of twelve men, in the county where the cauſe of action ariſes. 5. A commiſſion of the peace in every county of the circuit: and all juſtices of the peace and ſheriffs are to attend upon the judges, otherwiſe they are liable to be fined.

ASSISE is alſo uſed in ſeveral other ſignifications; as 1. For a jury, where aſſiſes of novel diſſeiſin are tried, and the pannels of aſſiſe ſhall be arraigned. 2. For a writ iſſued for the recovery of things immoveable, of which a perſon and his anceſtors have been diſſeized. 3. For an ordinance or ſtatute: thus the aſſiſe of the foreſt is a ſtatute concerning orders to be obſerved in the king's foreſt. 4. For a quantity of wheat, bread, &c. preſcribed by the ſtatute.

ASSISE *of Novel Diſſeiſin*, is a writ that lies where a tenant in fee ſimple, fee tail, or for term of life, is put out and diſſeized of his lands, tenements, rents, common of paſtures, common way, &c.

ASSISE *of Mort d'Anceſtor* is a writ which lies where a perſon's father, mother, brother, &c. died, ſeized of lands and tenements in fee, and after either of their deaths a ſtranger abated.

ASSISE *of Utrum* lieth for an eccleſiaſtic againſt a layman, or a layman againſt an eccleſiaſtic, for lands or tenements doubtful whether they be lay-fee or free-alms.

ASSIZE. See ASSISE.

ASSOCIATION, the act of aſſociating, or conſtituting a ſociety, or partnerſhip, in order to carry on ſome ſcheme or affair with more advantage.

The word is Latin, *aſſociatio*, and compounded of *ad*, to, and *ſocio*, to join.

ASSOCIATION *of Ideas*, is where two or more ideas conſtantly and immediately follow one another, ſo that the one ſhall almoſt infallibly produce the other, whether there be any natural relation between them or not.

When there is a real affinity or connection between ideas, it is the excellence of the mind to be able to collect, compare, and range them in order in its enquiries: but, on the contrary, where there is none, nor any cauſe to be aſſigned for their accompanying each other, but what is owing to mere accident or habit, the aſſociation is unnatural, becomes a great imperfection, and is too often a principal ſource of error or wrong deductions in reaſoning.

ASSOCIATION, in law, is a writ or patent ſent by the king, either of his own motion, or at the ſuit of the plaintiff, to the judges of aſſiſe, to have others aſſociated with them to take the aſſiſe. Upon this patent of aſſociation, the king ſends his writ to the juſtices of aſſiſe, commanding them to admit thoſe that are ſo ſent.

ASSONANCE, in poetry and rhetoric, is a term made uſe of to expreſs a ſimilarity of ſound in the final words of any particular phraſes, or verſes, without their being exactly in rhime; thus, for inſtance, in the following lines of Spencer,

And thou, Menalcas, fraught with treachery,
Shouldſt well be known for ſuch thy villainy.

There is a jingle but no rhime; which is regarded in Engliſh as a very great fault, whether it happens in verſe or proſe. It was eſteemed by the Romans as an elegance, and accordingly we meet with it very frequently in Cicero. It is ſtill in uſe among the Spaniards, where a reſemblance of ſound ſerves inſtead of a proper and natural rhime: thus, *ligera*, *cubierta*, *tierra*, *meſa*, are employed to anſwer each other as *aſſonant* rhimes, in regard they have each an *e* in the penultima, and an *a* in the laſt ſyllable.

ASSUMPSIT, in law, a voluntary or verbal promiſe, whereby a perſon undertakes to perform ſome agreement, or pay a certain ſum to another.

Thus, where a man ſells goods to another, the law makes the aſſumpſit; and promiſes he ſhall pay for them.

ASSUMP-

ASSUMPTION, a feſtival in the Romiſh church, celebrated in honour of the miraculous aſcenſion of the Virgin Mary, body and ſoul, into heaven.

The word is Latin, *aſſumptio*, and compounded of *ad*, to, and *ſumo*, to take.

ASSUMPTION, in logic, is the minor or ſecond propoſition in a categorical ſyllogiſm.

ASSUMPTION is alſo ſometimes uſed to imply a conſequence drawn from the propoſitions which compoſe an argument.

ASSUMPTIVE *Arms*, in heraldry, are ſuch as a perſon has a right to aſſume in conſequence of ſome noble and gallant action.

ASSURANCE, or INSURANCE. See INSURANCE.

ASSURRITANI, in eccleſiaſtical hiſtory, a ſect of heretics, who ſprang up in Africa, during the reign of Conſtantius, and were a branch of the Donatiſts. See DONATIST.

ASTAROTH, or ASHTAROTH, in antiquity, a goddeſs of the Sidonians.

The word is Syriac, and ſignifies ſheep, eſpecially when their udders are turgid with milk. From the fecundity of thoſe animals, which in Syria continue to breed a long time, they formed the notion of a deity, whom they called Aſtaroth, or Aſtarte. See ASTARTE.

ASTARTE, the ſingular of Aſtaroth, a goddeſs of the Sidonians, and called, in Scripture, the Queen of Heaven.

This deity is ſaid to have conſecrated the city of Tyre by depoſiting in it a fallen ſtar: and hence, perhaps, came the notion of a ſtar, or globe of light, which at certain times darted from Mount Libanus, near her temple at Aphac, and plunged itſelf into the river Adonis.

Mr. Fourmont, who has endeavoured to trace moſt of the pagan divinities mentioned in Scripture, ſuppoſes the Sidonian Aſtarte or Aſtaroth, to be the ſame with the Rachel of the Bible; becauſe the former in the Syriac language implies ſheep, and the latter has the ſame ſignification in the Hebrew.

ASTATI, in eccleſiaſtical hiſtory, a ſect of heretics in the ninth century, the followers of one Sergius, who renewed the errors of the Manichees.

The word is Greek, ἀστατοι, and compounded of ἀ, priv. and ἱστημι, to ſtand firm; becauſe they were remarkable for their inconſtancy.

ASTER, ſtarwort, in botany, a genus of plants producing a radiated flower, the diſk of which is compoſed of ſeveral funnel-ſhaped hermaphrodite floſcules, which ſpread open at the top in five parts, and contain five capillary filaments, topped with cylindrical antheræ, with an oblong germen ſupporting a filiform ſtyle. The rays or border compoſe the female floſcules, which are lanceolated and indented in three parts at the extremity, and are the ſame as the hermaphrodite in other reſpects, except wanting the ſtamina; the receptacle is plain and naked, and the ſeeds are of an oblong figure, oval at top, and winged with down.

There are various ſpecies of aſters, ſome of which are perennial, and others which are annual; but the moſt beautiful and greateſt in eſteem is the China aſter, commonly called the queen Margaret, of which there are three ſorts; one with purple flowers, another with pink-coloured flowers, and the third with white flowers: of each of theſe ſorts, there is a variety producing double flowers, which are moſt eſteemed. Theſe plants are raiſed on ſlight hot-beds in the ſpring, in order to forward their growth, ſo as to produce flowers early enough in autumn, that their ſeeds may be ripened. The common perennial ſorts are increaſed by parting their roots in autumn, ſome of which are very troubleſome to be eradicated, if ſuffered to run much, and are commonly called Michaelmas daizies.

ASTERIA, in natural hiſtory, a beautiful pellucid gem of variable colours, when viewed in different lights. It is generally known among jewellers by the name of cat's-eye. See CAT'S-EYE.

ASTERIA is alſo the name of an extraneous foſſil, called in Engliſh the ſtar-ſtone. See STAR-STONE.

ASTERISK, a mark or character in the form of a ſmall ſtar (*) placed over any word or ſentence, to render it more conſpicuous, or refer the reader to the margin, or elſewhere, for a quotation, explanation, or the like.

The word is a diminutive of the Greek, ἀστηρ, a ſtar.

ASTERISCUS. See BUPHTHALMUM.

ASTERISM, in aſtronomy, the ſame with conſtellation. See CONSTELLATION.

ASTERN, in the marine, any diſtance behind a ſhip, or in direct oppoſition to that point of the compaſs which is a-head, and to which her ſtem points; as when north is a-head, ſouth is a-ſtern. See A-HEAD.

ASTHMA, in medicine, a painful, difficult, and laborious reſpiration, occaſioned by an intolerable ſtraitneſs of the præcordia, which, by impeding the free circulation of the blood through the lungs, endangers a ſuffocation.

The word is Greek, ἀσθμα, and derived from ἀω, to breathe.

There are ſeveral ſorts of aſthmas: one difficulty of breathing proceeds from corpulency, and a very full habit of body; and is moſt apparent after violent motion; but this is a ſlight diſorder, and free from all danger. The next is the pituitous aſthma, attended with a moiſt cough, and the bringing up pituitous matter; it attacks the patient at all hours, and in all poſitions of the body; and

is owing to a plenty of a viſcid mucus ſtuffing the veſiculæ of the lungs, and hindering the free ingreſs and egreſs of the air through them. Another is owing to the convulſive contraction of the parts deſigned for reſpiration, and proceeds from various cauſes, both within and without the thorax; and this is called the dry, flatulent, or convulſive aſthma.

The longer this diſeaſe continues, the more ſharp and violent all the ſymptoms become. The patient's body grows more coſtive, and the urine is thin and watery; moſt commonly the feet ſwell, then the hands, face, and back; there is a numbneſs of the arms; the countenance is wan and livid, or of a leaden colour: then comes on a little fever, which grows worſe in the evening; the whole body is cachectic, with an œdematous ſwelling of the feet; there is a dropſy of the breaſt, or an aſcites, or anaſarca; at leaſt there is a palſy on one ſide, or of the arm; or inſtead thereof, a palſy of the eyelids. This diſeaſe is likewiſe called by ſome, a ſuffocating aſthma; by others the nervous aſthma.

When the diſeaſe is recent, and is owing only to the ſpaſmodic contraction of the præcordia, there are hopes of a cure; eſpecially if the matter of the gout, ulcers, and exanthemata, are ſent back to their proper ſeats. When the menſes or hæmorrhoids, which were ſtopped, return, it yields relief, and if the diſeaſe was not too far advanced, perfect health. If it is inveterate, or ill-managed, it brings on a dropſy of the breaſt, obſtructions of the lower belly, œdematous ſwellings of the feet, a cachexy, and an univerſal dropſy. In general, all convulſive aſthmas portend a ſudden exit, or ſuffocation, eſpecially if there is a polypus of the heart; if it continues long, then the patient will die of the dropſy; in which caſe it will be ſoon fatal: when there is a ſlow fever, an unequal intermitting pulſe, a palſy of the arms, a continual palpitation of the heart, little urine, a ſyncope or ſwooning, then death is at hand. Some are carried off by an inflammation of the lungs, and the more grievous the diſeaſe the more languid the pulſe. The aſthma, in old perſons, continues till death: that which is cauſed by a diſlocation of the vertebræ cannot be cured till they are reduced. The more violent the acceſſion, the longer it laſts, and the oftener it returns with a greater danger of ſuffocation.

In the paroxyſm, becauſe the body is generally bound, and the wind and humours are carried upwards, the ſpeedieſt aſſiſtance is from emollient and carminative clyſters.

If there is occaſion, it may be repeated two or three times: afterwards uſe frictions of the feet, which have an incredible efficacy; alſo let them be put into warm water; for the feet are almoſt always cold. When there is a violent ſpaſm about the præcordia, hot fomentations are neceſſary, or bladders filled with hot milk, and applied to the part affected; likewiſe nervous liniments are very uſeful, rubbed in with a warm hand.

Out of the fit, if it proceeds from too great a congeſtion of blood about the breaſt, or from a polypus of the heart, bleeding in the foot will be proper, as alſo ſcarifications; in a ſuppreſſion of the hæmorrhoids, leeches ſhould be applied to the anus; as alſo gentle laxatives to cleanſe the primæ viæ: likewiſe bodily motion, ſlender diet, and ſoft drink. If there are hypochondriacal or flatulent ſymptoms, then gentle laxatives will be the more neceſſary, together with clyſters. When the menſes or hæmorrhoids are ſuppreſſed, then nothing is better than the Bath waters, both for bathing and drinking; or the waters of Selters taken warm and mixed with milk.

When the aſthma proceeds from the driving back ſome impure matter from the ſkin, or from the drying up of ulcers, and the humour is tranſlated to the nervous parts of the breaſt, then gentle diaphoretics will be neceſſary to ſend it back to the ſuperficies of the body.

ASTRÆA, in mythology, the goddeſs of Juſtice. She was the daughter of Jupiter and Themis, and came down from heaven in the golden age; but when the manners of men became corrupt, ſhe left the earth and returned to heaven.

ASTRÆA, in aſtronomy, the ſame with Virgo. See VIRGO.

ASTRAGAL, in architecture, a ſmall round moulding in form of a ring, ſerving as an ornament at the top and bottom of columns. Sometimes the aſtragal is put to ſeparate the faſciæ of the architrave; in which caſe it is ornamented with beads and berries, chaplet-wiſe. It is likewiſe uſed above and below the liſts, adjoining immediately to the dye, or ſquare of the pedeſtal. See COLUMN.

ASTRAGAL, in gunnery, a round moulding, encompaſſing the cannon about ſix inches from its mouth.

ASTRAGALUS, wild liquorice, or milk-vetch, in botany, a genus of plants producing papilionaceous flowers, which contain ten filaments, nine of which are joined together, and one ſtands ſingle, and topped with roundiſh antheræ: the germen is tapering, and becomes an oblong bilocular pod, containing a row of reniform ſeeds. It is ſaid to be diuretic, and to increaſe the milk of nurſes.

ASTRAL, in aſtronomy, is ſomething belonging to, or connected with the ſtars; as aſtral year is the ſame as ſyderial year.

ASTRINGENTS, among phyſicians, ſuch medicines as are of an aſtringent or binding quality.

The word is formed from the Latin, *ad*, to, and *ſtringo*, to bind.

Hoffman.

Hoffman very judiciously observes, that astringents are very proper to restore a tone and elasticity to the animal fibres, when debilitated by diseases, intemperance, or accident: but they are very seldom proper without a previous attenuation of the juices, and a course of deobstruent medicines; because obstructions are more firmly riveted, and the viscid juices circulated with more difficulty, when the diameters of the vessels are constricted by astringents.

ASTRORITES, the star-stone, in natural history; see the article STAR-STONE.

ASTROLABE, among the antients, was the same with what we now call an armillary sphere. It was also the name of a stereographic projection of the sphere, either on the plane of the meridian, equator, or any great circle, which are commonly called planispheres.

The *Sea* ASTROLABE is an instrument formerly used for taking the sun's altitude at sea; but since the invention of Hadley's Quadrant, they are rare to be met with, that instrument being so much superior. The sea astrolabe consists of a brass circle, about one foot in diameter, and six or seven lines in thickness, that it might be pretty weighty: there was sometimes a weight of six or seven pounds suspended at the point C, (Plate XI. *fig.* 5.) so that when the astrolabe was hung by the ring A, which was moveable, the instrument would turn any way, and keep a perpendicular situation, notwithstanding the motion of the ship. The limb of this instrument is usually divided into four times 90°, and sometimes into halves, or quarters of degrees. It is absolutely necessary that the right line D, G, B, which represents the horizon, be perfectly level, so that the beginning of the divisions of the limb of the instrument may be graduated therefrom. Now to examine this, observe some distant object through the slits or sights F E, and fastened near the ends of the index, freely turning about the center G; place your eye to one of the said sights, as F, and look at a distant object through the other sight E; then turning the astrolabe about, letting the index remain at rest, look for the distant object, placing your eye at E; and if you find it through the other sight F, without moving the index, you are certain the fiducial line of the index is right, or truly horizontal. But if at the second time of observation, the index must be raised, or lowered, before the object becomes visible through the two sights; then the middle point between the two positions will shew the true horizontal line passing through the center of the instrument, which must be verified by repeated observations, before the divisions of the limb are begun to be graduated.

The method of making observations with this instrument, is, to hold the astrolabe suspended by the ring, and turn its side toward the sun; then move the index or label till the sun's rays shine through both the sights on the index, and you have the sun's altitude pointed out on the limb by the extreme points of the index, comprehended between the horizontal radius G D, and the sun's rays F G E *, because the instrument in this situation represents a vertical circle.

The astrolabe by some is now accounted the best instrument for observing the sun's altitude when near the zenith; but we apprehend it is only by such who have not been used to make observations with accuracy; nor can we find by experience where the difficulty lays, so much talked of by navigators, in observing the sun's altitude when in the zenith, with a Hadley's Quadrant; but rather look upon it as the most accurate of any, being almost instantaneous; though the reason, we apprehend, from what we have seen, arises from their observing about once in a minute, and the sun changing its azimuth so very instantaneously, that they have lost it when they look again, and so from their own neglect arises the difficulty.

ASTROLOGICAL, something belonging to astrology.

ASTROLOGY, in the modern acceptation, implies the pretended art of foretelling future events, by observing the different aspects and situations of the heavens, and from thence to judge of the effects and influences of the stars and planets on human actions.

The word astrology is formed from the Greek ἀστρο, a star, and λογία, a discourse; whence in the literal sense, it signifies the doctrine or science of the stars, and was formerly the same with what we now call astronomy. The reason of this change of the word astrology to astronomy, was because of the absurdities that were gradually introduced into that science, by such whose natural inclination led them to impose on the weak and credulous part of mankind; which they found could not be done more effectually and plausibly, than by pretending to foretel future events from their great knowledge of the heavens. Therefore those whose only desire was to seek after truth, thought proper to distinguish themselves by the name of astronomers, from those jugglers of mankind; not being willing to be encouragers and partakers with them in the least shadow or appearance.

In the present age, astrologers, or conjurors, have by our legislature been obliged to keep their knowlege to themselves, not daring publicly to expose it to sale; by which means it is become contemptible for any to declare their belief therein: however, from our own knowledge we are sorry to declare, that the number is incredible who secretly apply at different places to be made acquainted with their future fortune. The motives are chiefly a desire of matrimony, revenge, grandeur, and sometimes

ſometimes covetouſneſs. The greateſt number conſiſts chiefly of thoſe whoſe motive is matrimony; nor need we wonder, when we conſider how ſtrongly the inclinations of youth are directed that way by nature, and how hard it is on the fair ſex that they are obliged to fulfil the old proverb, which we apprehend moſt of our readers are acquainted with. It is very ſurprizing that many of thoſe are very ſenſible and diſcerning in every other particular, and yet ſuffer themſelves in this article to be impoſed upon with very little or no trouble, and even become ſtrong advocates for their deceivers, where they are not aſhamed to own their connections or enquiries.

Aſtrology is commonly divided into two branches, natural and judicial.

The former being the production of natural effects, as the changes of weather, winds, hurricanes, ſtorms, earthquakes, floods, thunder, rain, &c. this art properly belongs to phyſiology, or natural philoſophy, and is only to be gathered from accurate and continual obſervation of the different phœnomenas in nature.

The latter is that which pretends to foretel moral events, or ſuch as have a freedom of the will. This art is ſometimes called divining; it treats of the revolution of the years of the world, of nativities, of horary queſtions, good or bad hours, diſtribution of houſes, &c. all ridiculous and ſtupid.

ASTRONOMICAL, ſomething belonging to aſtronomy; thus we ſay, aſtronomical calendar, characters, column, horizon, hours, month, obſervation, place, quadrant, ring-dial, ſector, tables, teleſcopes, time, year, &c. See each under its reſpective article, CALENDAR, CHARACTER, &c.

ASTRONOMY, that ſcience which treats of the heavenly bodies, teaching us to obſerve and diſcover their true motions, magnitudes, diſtances, eclipſes, oppoſitions, conjunctions, mutual aſpects, &c.

Aſtronomy, among all the ſciences ſtudied by man, may be eſteemed the moſt excellent and moſt ſublime; for there is no other knowledge, acquired by the light of nature, which teaches us truer or juſter notions of the Supreme Being than aſtronomy. Nothing ſupplies us with more forcible and convincing arguments of the being of a God, than our contemplation on the celeſtial bodies, and obſerving their motions. By aſtronomy we diſcover the wonderful harmony of nature, wherewith the frame and ſtructure of all created beings are linked and knit together, to conſtitute the great machine of the univerſe. No ſcience raviſhes the mind of man ſooner into an admiration and adoration of his Maker; for who can contemplate on ſo many immenſe bodies, endowed with heavenly light, ſo beautiful to the eye and amuſing to the mind; or who can conſider their mutual intercourſes, regular motions, determined circulations, their revolutions and periods, all ſettled by a divine law with ſuch admirable harmony, but muſt cry out with David, *The heavens declare the glory of God, and the firmament ſheweth his handy-work*; or with Cicero, who was only guided by the light of reaſon, "Nothing is more evident, nothing more "plain, when we look up to the heavens and con"template the bodies there, than that there is a "Deity of moſt excellent wiſdom who governs "them." It is by this ſcience that the very faculties of man are enlarged with the grandeur of the ideas it conveys, his mind exalted above the low contracted prejudices of the groveling vulgar, and his underſtanding clearly convinced of the exiſtence, wiſdom, power, goodneſs, omniſcience, omnipreſence, omnipotence, and ſuperintendency of the Supreme Being, over, and in all his works!

The greateſt heroes in various ages, as well as kings and emperors, have taken pleaſure to ſtudy and improve this ſcience: the Chaldean wiſemen and philoſophers were always reverenced by their antient kings, who thought it abſurd that any ſhould govern the world, who knew not what the world was. There is no ſcience in which there are fewer difficulties to be explained, objections to be anſwered, or ſcruples to be removed, than there are in aſtronomy, or perhaps, that has attained to greater perfection than it has at this preſent time. The certainty and evidence of its demonſtrations is not inferior to geometry; its uſefulneſs is manifold; and the ſcope of its ſubject ſo large, that it comprehends nothing leſs than the whole univerſe.

Aſtronomy is not only uſeful and pleaſing, as it improves the mind, and by its delightful ſpeculations encreaſes the force and penetration of the underſtanding, but it is likewiſe a conſiderable help to the perfecting of other arts and ſciences. In how great darkneſs would the geographers and the chronologiſts wander, were they not aſſiſted with light from aſtronomy? To it we are indebted for our knowledge of the figure and magnitude of the earth, and the method of finding or determining the ſituations and diſtances of places. We learn from it the true meaſure of the year, and can give an account of actions according to the true order of the times in which they happened. It is from aſtronomy we are certain, that the darkneſs at the crucifixion of our Saviour, was not any eclipſe of the luminaries, but the diſpleaſure of the Almighty, which he pleaſed to ſignify by a ſupernatural cauſe, and as a miracle to convince all deiſtical aſtronomers, as well as others, of the divinity of his beloved Son. Hence it is evident how uſeful aſtronomy is to human affairs; for without it we could have no geography nor chronology, and conſequently, no certain account of hiſtory.

But among all the arts there is none that has received greater improvements from aſtronomy, than navigation has done. For by our knowledge in it, we can carry our ſhips through the vaſt ocean in a right courſe, though there is no tract to be ſeen, and viſit the utmoſt regions of the earth. Hence ariſe the advantages of trade and commerce; ſo that whatever things other countries afford, that are either precious or delightful, we receive and enjoy without the inconveniencies of intemperate heats or colds, to which thoſe countries are liable. It is owing to our ſkill in navagation, that our Britiſh monarchs have obtained the ſovereignty of the ſeas: ſo that there is no nation at what diſtance ſoever, but what are kept from doing injuries to our countrymen, by the terrors of a Britiſh fleet.

By aſtronomy, in its preſent perfection, we are enabled to foretel, for many ages to come, the eclipſes both of the ſun and moon, very minutely; their quantities and durations, the conjunctions, oppoſitions, and mutual aſpects of the planets, and what will be the diſtances of all the ſtars from the pole at any time, their places and motions having been exactly ſettled from conſtant obſervation; though at the ſame time the ſcience of geography, or a deſcription of our own habitation, is ſo imperfect, that we have an exact determination of the longitudes and latitudes of but a very few places: however, we do not doubt but the honourable commiſſioners of the board of longitude will ſhortly take this into conſideration, and ſend out a perſon properly qualified, with good inſtruments, to apply the noble ſcience of aſtronomy as much as poſſible, where it is ſo very beneficial to mankind; for being able to determine the longitude of the ſhip will be of little ſervice, if we are unacquainted with the longitude of the port bound for.

No philoſopher has ever yet diſcovered the figures of the ſmall particles of matter, or the texture, intervals, form, and compoſition of the parts of the moſt common plant. Nor has any phyſician yet found out the reaſon of the virtues and operations, by which their medicines affect the human body. And even in all animated and vegetable bodies, the fountain and firſt principle of life and action is unſearchable, and looks like a myſtery much beyond the reach of our underſtanding, which knowledge perhaps in this life is never to be attained. But aſtronomers in their proper ſcience meet with no ſuch difficulties; they contemplate not the natures, but the motions, of the celeſtial bodies, and they clearly account for the phœnomena, or appearance, that ariſe from thence; they not only determine what ſort of motion the planets have, and in how large a compaſs they circulate, but they likewiſe ſhew us the crooked tracts in the immenſe regions of ſpace, which the wandering comets take; they can give us the geometrical properties of their orbits, and the laws which they obſerve in deſcribing them. The aſtronomers are not ignorant where or when the planets are at their fartheſt diſtance from the ſun, and participate the leaſt of his heat and light; from whence they return, and are conſtantly quickened in their motions by the ſun, who draws them towards himſelf, till they come to thoſe parts of ſpace where they make their neareſt approach to him, enjoy moſt of his heat and light, and are actuated by the greateſt force of their own gravity.

By aſtronomy we have learned the vaſt diſtance of the earth from the ſun; and although its circumference is found to be 25,020 miles, yet, if viewed by a ſpectator placed at the ſun, would ſcarce be viſible, or appear no bigger than a point. But what is this diſtance when compared with that immenſe ſpace betwixt us and the fixed ſtars? for though the earth, in its annual revolution, is nearer to ſome of the ſtars at one time of the year than at another, about 162 millions of miles, yet their apparent magnitudes, ſituations, and diſtances from one another, ſtill remain the ſame: nor has our moſt ingenious aſtronomer, Dr. Bradley, with the moſt accurate inſtruments, been able to diſcover that the neareſt ſtars have any parallactic angle, though obſerved at ſuch periods of the earth's orbit, that the two ſtations of obſervation are no leſs diſtant than 162 millions of miles from each other; and often have we heard this great man declare, that if their parallax had amounted to half a ſecond, he did not doubt but he ſhould have diſcovered it.

By the aſſiſtance of teleſcopes we diſcover an innumerable quantity of ſtars, which are not perceivable with the naked eye, and the better our glaſs, the more of thoſe teleſcopical ſtars become viſible; therefore, when we conſider theſe things, we may very naturallly conclude, that they are not placed in one concave ſurface, but ſcattered at immenſe diſtances from one another, through unbounded ſpace.

The ſun, from our proximity with it, appears very large, bright, and ſplendid, in compariſon of the ſtars; but was an obſerver placed at the ſame diſtance from one as the other, no doubt but he would find them put on the ſame appearance in every circumſtance. When we conſider the immenſe diſtance of the ſtars from the ſun, we muſt conclude that they ſhine with their own native and unborrowed light; for the rays of light paſſing through ſuch an immenſe ſpace muſt be ſcattered and diſſipated before they arrive at ſuch remote objects, nor could they be tranſmitted back to our eyes, ſo as to render theſe ſtars viſible by reflection: much more to ſhine with that luſtre and brilliancy that many of them do, eſpecially Syrius, which ſeems to vie in ſplendor with ſome of the planets.

It is no ways probable that the Almighty, who always acts with infinite wisdom, and does nothing in vain, should create so many glorious suns, fit for so many important purposes, and place them at such distances from one another, without proper objects near enough to be benefited by their influences. Whoever imagines they were created only to give a faint glimmering light to the inhabitants of this globe, must have a very superficial knowledge of astronomy, and a mean opinion of the Divine Wisdom; since, by an infinitely less exertion of creative power, the Divinity could have given our earth much more light by one single additional moon.

Instead then of one sun and one world only in the universe, as the unskilful in astronomy imagine, that science discovers to us such an inconceivable number of suns, systems, and worlds, dispersed through bound'ess space, that if our sun, with all the planets, moons, and comets belonging to it, were annihilated, they would be no more missed out of the creation than a grain of sand from the sea-shore; the space they possess being comparatively so small, that it would scarce be a sensible blank in the universe; although Saturn, the outermost of our planets, revolves about the sun in an orbit of 4884 millions of miles in circumference, and some of our comets make excursions upwards of ten thousand millions of miles beyond Saturn's orbit; and yet, at that amazing distance, they are incomparably nearer to the sun than to any of the stars, as is evident from their keeping clear of the attractive power of all the stars, and returning periodically by virtue of the sun's attraction.

From what we know of our own system, it may be very reasonably concluded that all the rest are with equal wisdom contrived, situated, and provided with accommodations for rational inhabitants.

To an attentive considerer, it will appear highly probable, that the planets, together with their attendants called satellites or moons, are much of the same nature with our earth, and destined for the like purposes: for they are solid opake globes, capable of supporting animals and vegetables. Some of them are bigger, some less, and some much about the size of our earth. They all circulate round the sun, as the earth does, in a shorter or longer time, according to their respective distances from him; and have, where it would not be inconvenient, regular returns of summer and winter, spring and autumn. They have warmer and colder climates, as the various productions of our earth require; and in such as afford a possibility of discovering it, we observe a regular motion round their axes, like that of our earth, causing an alternate return of day and night, which is necessary for labour, rest, and vegetation, and that all parts of their surfaces may be exposed to the rays of the sun.

Such of the planets as are farthest from the sun, and therefore enjoy least of his light, have that deficiency made up by several moons, which constantly accompany and revolve about them, as our moon revolves about the earth. The remotest planet has, over and above, a broad ring encompassing it, which, like a lucid zone in the heavens, reflects the sun's light very copiously on that planet: so that if the remoter planets have the sun's light fainter by day than we, they have an addition made to it morning and evening by one or more of their moons, and a greater quantity of light in the night-time.

On the surface of the moon, because it is nearer us than any other of the celestial bodies are, we discover a nearer resemblance of our earth: for, by the assistance of telescopes, we observe the moon to be full of high mountains, large vallies, and deep cavities. These similarities leave us no room to doubt but that all the planets and moons in the system are designed as commodious habitations for creatures endowed with capacities of knowing and adorning their beneficent Creator.

Since the fixed stars are prodigious spheres of fire, like our sun, and at inconceivable distances from one another, as well as from us, it is reasonable to conclude they are made for the same purposes that the sun is; each to bestow light, heat, and vegetation, on a certain number of inhabited planets, kept by gravitation within the sphere of its activity.

What an august! what an amazing conception, if human imagination can conceive it, does this give of the works of the Creator! Thousands of thousands of suns, multiplied without end, and ranged all around us, at immense distances from each other, attended by ten thousand times ten thousand worlds, all in rapid motion, yet calm, regular, and harmonious, invariably keeping the paths prescribed them; and these worlds peopled with myriads of intelligent beings, formed for endless progression in perfection and felicity!

If so much power, wisdom, goodness, and magnificence, is displayed in the material creation, which is the least considerable part of the universe, how great, how wise, how good, must he be, who made and governs the whole!

It does not seem improbable, or to be in the least doubtful, but that there was some kind of observations of the celestial bodies as soon as there were men, when we consider the beautiful appearance which the heavens constantly present; which is both so glorious and useful, that men could not have eyes to see, and not fix them attentively and considerately thereon.

Among other appearances they could not easily neglect observing the sun change his place of rising and setting; likewise, at certain times of the year, to approach nearer to the earth in his diurnal arch, and at others to mount up to a height much more remote from it; and that his apparent approaching

proaching nearer to the earth made winter, and his removing higher made ſummer.

Again, ſo admirably various did the moon appear in her ſeveral ſhapes and dreſſes of light, that ſhe muſt naturally engage the eyes of man to frequent ſpeculations, eſpecially when ſhe aſſumed thoſe various phaſes or appearances at particular and certain times, which, doubtleſs, was the cauſe that every nation meaſured their times and ſeaſons by obſerving her conſtant and periodical circuits; becauſe thoſe periods ſucceeded much more frequent than the viſible elevations and depreſſions of the ſun. To theſe we may likewiſe add that beautiful and ſpangled view of the nightly ſtars, undergoing likewiſe their variations, according to the variety of the ſeaſons, and more particularly of the planet Venus, which they muſt obſerve to riſe ſometimes before the ſun, and ſometimes to ſet after the ſun—Therefore, from ſuch conſiderations, we may reaſonably conclude that celeſtial obſervations are as antient as man, tho' it might be ſome time before they enquired into the cauſes of theſe celeſtial changes; only accommodating what they firſt obſerved to the uſes of their lives.

But, becauſe this is too general a method of obſervation, we ſhall look back into thoſe times wherein men firſt began to reduce their celeſtial obſervations into method, and founded the art and ſcience of aſtronomy thereon.

Joſephus, the learned antiquarian of the Jews, affirms, "That the ſons of Seth invented the ſci-"ence of the heavens before the flood, and en-"graved the ſame on two pillars, the one of brick, "and the other of ſtone, ſo that it might be pre-"ſerved in one, if by any accident it ſhould be "deſtroyed in the other." But as we find nothing of this in ſacred writ, or any other profane hiſtory to ſtrengthen this affirmation of Joſephus, we cannot therefore think it ſufficient to diſcuſs the darkneſs wherein the origin of aſtronomy ſeems involved: nor does the reaſon this antiquarian gives ſeem ſtrong enough to evince that aſtronomy was reduced to a ſcience before the flood; for he ſuppoſes the duration of men's lives, in thoſe days, was ſufficiently long to perfect the knowledge of aſtronomy.

Again, the origin of aſtronomy might be deduced from not long after the flood, if in ſacred writ we could find the leaſt word from whence might be argued the truth of what the ſame author writes; namely, that the Egyptians were taught aſtronomy by Abraham. It is probable enough that Beroſus and others, quoted by Joſephus and Euſebius, might have read ſome ſuch thing among ſome books of the old rabbins: but that the ſame ſhould be learned from holy writ, is moſt improbable, there being no mention made of any ſuch thing. Indeed it is written that Abraham came from Ur of the Chaldeans, but not that he learned, or received aſtronomy from them, or that he delivered it from them to the Egyptians; nor will the learned Doctor Saliannus allow it to be even probable that he ſhould inſtruct the Egyptians in this ſcience, becauſe of his ſhort ſtay among them. The moſt ancient monument of the ſcience of the ſtars that can be found in holy writ is what is ſaid concerning Moſes, when he was admitted into the Egyptian court; namely, that he was "learned in all "the wiſdom of the Egyptians;" and doubtleſs the wiſdom of the Egyptians was contained in the mathematics, and aſtronomy was always eſteemed the beſt and moſt ſublime part of them.

If we look back into that part of time which is called obſcure or fabulous, we poſſibly may find ſomething relating to our inquiry wrapped up in darkſome ſhrouds of fables.

The moſt ancient of the heathen gods, we are told by Diodorus Siculus, was Cœlus, ſo called, becauſe of his high devotion to, and delight in the obſervation of the ſtars. This eminent perſon being the father of many ſons, as Atlas, Saturnus, the Titanes; and among thoſe eſpecially, Hyperion, and Japetus, from whence we may conjecture, that they being induced by his example, were addicted to the ſame ſtudy: for Cœlus, living near the ocean in Mauritania, extended his kingdom over all Africa, and likewiſe into a conſiderable part of Europe, where it is well known, that his ſon Atlas ſucceeded him in the ſame dominions, where he gave his own name to the higheſt mountain of that country, becauſe he frequently made obſervations of the motions of the heavens on the top thereof. For the ancients in thoſe days imagined the concave arch of the heavens to be but at a ſmall diſtance from the top of high mountains; and that the higher they aſcended up thoſe hills, the more clear and diſtinct they could obſerve celeſtial objects. To this Diodorus Pliny and others add, that Atlas was feigned to ſupport heaven on his ſhoulders, becauſe he had framed a ſphere or globe, which ſtrongly repreſented the whole heavenly machine. Clemens Alexandrinus remarks, that Hercules, being both a prophet and philoſopher, was reported to come and relieve Atlas, by taking the vaſt burthen of heaven on his own ſhoulders; which we apprehend means nothing more than that he ſucceeded him in the ſtudy or ſcience of celeſtial bodies. Heſperus, the ſon of Atlas, is reported to have been ſnatched away by ſome ſudden and violent diſeaſe, while obſerving and ſpeculating the ſtars on the top of the ſaid mountain; from whence the common people, in reſpect to his piety and juſtice, gave his name to the moſt brilliant and beautiful ſtar, which is alſo called Veſpergo, being the evening-ſtar while ſeen in the weſt. As for his ſiſters, called both Atlantiades and Pleiades, their names were given to that company

pany of ſtars which are viſible in the back of Taurus; and of one of thoſe was born the famous Mercurius, who is ſaid to have firſt brought the ſcience of the ſtars into Egypt; whence, Marcillus, writing of the aſtronomy of the Egyptians, ſays of Mercury, *Tu princeps, authorque ſacri Cyllene, tanti*, &c. The Ethiopians contend that they received aſtronomy from them; for firſt Diodorus, and afterwards Lucian, has obſerved the ſame. Cicero ſaith of Atlas and Prometheus "That neither had "Atlas been believed to have ſupported heaven on "his ſhoulders, nor Prometheus to have been chained "on Caucaſus; nor Cepheus, with his wife, ſon-in-"law, and daughter, been ſtellified, had not their "divine cognition of celeſtial bodies firſt occaſion-"ed the perpetuation of their names in the diſ-"guiſe of fables." Saturn, another ſon of Cœlus, who reigned in Italy, Sicily, and Crete, proſecuted his father's ſtudies no leſs than the former; and it is very probable that he was the firſt that underſtood the motion and courſe of the planet Saturn, which is the ſloweſt of all in its celeſtial circuits, becauſe he bears that name. Jupiter, his ſon, applied his mind to the ſtudy of the heavens, and for that purpoſe choſe the high mountain Olympus, to make his obſervations upon, which is the reaſon that he afterwards is called Olympus, and the name of the mountain transferred into heaven; and Jupiter, becauſe of his great underſtanding of the order and laws, is ſaid to have the dominion of heaven.

Diodorus ſaith that Hyperion, who was one of the progeny of Cœlus likewiſe, demonſtrated the courſes of the ſun and moon, and therefore called the ſun Helios, after the name of his ſon; and the moon Selene, after that of his daughter.

Japetus performed nothing worthy notice in his father Cœlus's ſpeculations; but Prometheus whom he begat, who is feigned to have been chained on the hill Caucaſus, and to have his heart perpetually torn by a hungry eagle or vulture, made great advances in the ſcience of aſtronomy. Servius thinks the above fable means nothing more than that with reſtleſs care, and ſolicitude of mind, he conſtantly excruciated himſelf with obſerving the ſtars, and ſtudying their right aſcenſions and declinations. The ſame author likewiſe inſiſts that Prometheus was the firſt that introduced aſtronomy and aſtrology to the Syrians not far from Caucaſus. With regard to the fabulous ſtory of his having ſtolen fire from heaven, for the inanimation of man, means nothing more than that he infuſed his heavenly knowledge of the ſtars, and of other celeſtial motions, into the breaſts of men, and inflamed their minds with a deſire of ſtudying that noble ſcience. If we examine the fabulous hiſtory of Phaeton, we may ſuppoſe it hath this mythology; that in his life he had made a conſiderable progreſs towards diſcovering the apparent motion and annual courſe of the ſun, but, dying immaturely, left the theory thereof imperfect. Likewiſe that of Bellerophon, who is ſuppoſed to have been carried up into heaven by a flying horſe, only ſignifies that he was ſtudious, and had a contemplative mind, eager in the queſt of ſydereal myſteries. Again, that of Dedalus, who is likewiſe reported to have been carried into heaven, which aroſe from his great attention to this ſcience, and his towering ſpeculations; while his leſs ingenious ſon Icarus falling much ſhort of his father, both in theſe ſublime obſervations and in underſtanding the reaſons and demonſtrations of his theory, made little progreſs, in his ſtudies; and fell from the true and epodictical cognition of celeſtial motions and viciſſitudes.

There are likewiſe many others mentioned by Lucian, as that of Endymion, the favourite of the moon; of Tireſias, the prophet, &c. There is mention made both by Lucian and Tacitus, under the account of heroical times, which ſeems to come ſomewhat nearer to the hiſtorical, of a remarkable contention that aroſe betwixt Atreus and Thyeſtes about ſupreme dominion; when, by the vote of the Argives, the kingdom was to be given to him who ſhould give the moſt eminent teſtimony of ſcience. Thyeſtes ſhewed them the ſign Aries in heaven, for which he was honoured with a golden ram: but Atreus declared a thing far more excellent; for he made it appear that the apparent motion of the ſun and of the ſtarry orb were not carried the ſame, but quite contrary ways; and conſequently, that the part of the heavens which was the weſt, or occident, of the ſtarry orb, was the very riſing, or orient, of the ſolar orb: therefore Atreus was made king, becauſe of his ſuperior knowledge in aſtronomy. Lucian reports of Orpheus, that he ſtudied attentively the ſeven planets, and that he repreſented their harmony by the ſeven-ſtringed harp. Uranus, king of the country ſituated on the ſhore of the Atlantic ocean, for his ſkill in aſtronomy, is ſaid to have been deſcended from the gods. Zoroaſter, a Perſian philoſopher, is celebrated by all antiquity, as a ſkilful aſtronomer: and the honour and dignity of this ſcience was had in ſo great a reputation, as to be called the Royal Science, being that in which kings moſt delighted above all others; for the kings of Africk and Syria firſt invented and improved it, and that long before it was known in Greece. This Plato acknowledges in his Dialogue which he calls Epinomis. "The firſt, ſays he, who obſerved theſe "things, was a barbarian, who lived in an ancient "country, where, upon the account of the clear-"neſs of the ſummer-ſeaſon, they could firſt diſ-"cover them, ſuch as Egypt and Syria, where the "ſtars are clearly ſeen, there being neither rains "nor clouds to hinder their proſpect. And be-"cauſe we are more remote from this ſummer-"clearneſs of weather than the barbarians, we "came later to the knowledge of theſe ſtars." So

Lucian

Lucian tells us, "That the Ethiopians firſt took "notice of the heavenly motions, and, by finding "the cauſes of the lunations, they knew that the "moon had no proper light of its own, but bor- "rowed it from the ſun." However, it is certain that aſtronomy, from the very beginning, was cultivated and improved by the eaſtern nations: for if we may believe Porphyry, when Alexander took Babylon, Caliſthenes, at the deſire of Ariſtotle, carried from that city the obſervations of 1903 years, which brings the beginning of theſe obſervations to 115 years after the flood, and 15 years after the building of Babel. Pliny, in his Natural Hiſtory, relates that Epigenes affirmed, that the Babylonians had obſervations of 720 years, all graven upon bricks. And Achilles Tatius, in the beginning of his Introduction to Aratus's Phænomena, informs us, "That the Egyptians were the firſt "who meaſured the heavens and the earth; and "their ſcience in this matter was engraven on co- "lumns, and by that means delivered to poſterity. "Yet the Chaldeans take the honour of the inven- "tion to themſelves, and aſcribe it to Belus." The Greeks had all their aſtronomical learning from Egypt: for Laertius owns that Thales, Pythagoras, Eudoxus, and many others went to that country to be inſtructed in the ſidereal ſcience: theſe men were not only the firſt, but the greateſt philoſophers that Greece produced: and from the ſame author we know, that thoſe who ſtaid longeſt in that country were moſt famous for their ſkill in geometry and aſtronomy, after they returned home: ſo Pythagoras, who lived in ſociety with the Egyptian prieſts ſeven years, and was initiated into their religion, carried home from thence, beſides ſeveral geometrical inventions, the true ſyſtem of the univerſe; and was the firſt that taught in Greece, that the earth and planets turned round the ſun, which was immoveable in the center, and that the diurnal motion of the ſun and fixed ſtars was not real, but apparent, ariſing from the motion of the earth round its axis. At that time no body was eſteemed as a philoſopher, but who was well acquainted with the mathematical ſciences.

But theſe ſciences were ſoon neglected by the philoſophers that came after them, who much degenerating from their predeceſſors, had ſo little care and concern for the mathematical ſciences, eſpecially aſtronomy, that of all the obſervations of eclipſes, for the ſpace of near 2000 years, that were ſent from Babylon by Caliſthenes, Ptolomy could recover but a very few, the reſt being loſt by the careleſſneſs, negligence, and want of ſkill of thoſe men who ſhould have preſerved them; for theſe pretenders to philoſophy, having no concern for the uſeful parts of it, ſpent their time about trifles, and diſputes of no value, and in endeavouring to find out ſophiſms, whereby they would impoſe upon their own and the common ſenſe of all mankind: ſuch were Zeno's arguments againſt motion, and moſt of the philoſophers diſputations againſt the diviſibility of matter *in infinitum*; whereas a little knowledge of geometry would eaſily have diſſolved all the difficulties they could raiſe. But tho' aſtronomy was thus baniſhed out of the ſchools of the common philoſophers, yet it was received and cultivated by ſome, tho' but a few, eſpecially by the Pythagorean ſect, which flouriſhed in Italy many years, among whom was Philolaus and Ariſtarchus Samius. The Ptolemy's, kings of Egypt, were alſo great patrons of learning; they founded an academy for aſtronomy at Alexandria, which furniſhed us with great men, the chief of whom was Hipparchus, who, according to Pliny, "undertook a buſineſs which would have been a "great work for a god to perform, that is, to number "the ſtars, and leave the heavens for an heritage to "all that come after." This man foretold the eclipſes of both ſun and moon for ſix hundred years; and upon his obſervations is founded that precious work of Ptolomy, which he called his μεγαλη συνταξις, or his Great Conſtruction; for from them he gathered the preceſſion of the equinoxies, and the theory of the planets.

When Egypt was conquered by the Saracens, and Alexandria reduced under their juriſdiction, the conquerors took aſtronomy, with the reſt of the liberal arts, under their protection; and took care that moſt part of the books concerning the liberal arts and ſciences ſhould be tranſlated from the Greek into their own Arabian language.

The Saracens paſſing from Africa into Spain, and having a commerce with the weſtern European nations, imparted to them the ſcience of aſtronomy, which before was almoſt loſt in Europe; ſo that about the year 1230, at the command of the emperor Frederick, Ptolemy's Almageſt, or his great Syntaxis, was tranſlated from the Arabic into Latin.

After that time, aſtronomy received many improvements from the patronage of the greateſt princes, and the labours of the moſt celebrated philoſophers; among whom, in the firſt place, is to be named Alphonſus king of Caſtile, who is never to be forgotten, on the account of the aſtronomical tables called after his name. Nicolaus Copernicus was not only a diligent obſerver, but alſo a reſtorer of the ancient Pythagorean ſyſtem. Prince William, landgrave of Heſſe, who procured quadrants and ſextants much larger than what were formerly uſed, to obſerve the true places of the ſtars: this prince's obſervations are publiſhed by Snellius. Sir Henry Savill was moſt ſkilful both in aſtronomy and geometry, who is ever to be honoured for his munificence in founding our two profeſſorſhips of aſtronomy and geometry in the univerſity of Oxford, and endowing them with ample ſalaries: upon which account, and many other be-

nefits he beſtowed on the learned world, he will always be had in remembrance with the greateſt reſpect. That noble Dane, Tycho Brache, who for his ſkill in obſerving, was ſuperior to all that went before him; and who, for the furniture of his obſervatory, exceeded even princes and kings. He publiſhed a catalogue of ſeven hundred and ſeventy fixed ſtars, which he had diligently obſerved. John Kepler, a moſt excellent aſtronomer, by the help of Tycho's labours, found out the true ſyſtem of the world, and the laws the celeſtial bodies obſerve in their motions, with which he vaſtly improved aſtronomy: his excellent works are well known to the learned world, and will ever ſhew how much he is to be praiſed. Galileus, the Lyncean philoſopher, who firſt applied a teleſcope to the heavens, and by its means diſcovered a great many new ſurprizing phænomena; as the moons or ſatellites of Jupiter, and their motions; the various phaſes of Saturn; the increaſe and decreaſe of the light of Venus; the mountainous and uneven ſurface of the moon; the ſpots of the ſun; and the revolution of the ſun about his own axis; all which were firſt obſerved by this great philoſopher.

Hevelius has given us a catalogue of ſtars much larger than Tycho's, compoſed from his own obſervations. Huygens and Caſſini firſt ſaw the ſatellites of Saturn, and diſcovered his ring. Mr. Flamſtead, who for more than forty years watched the motion of the ſtars, and has given us innumerable obſervations of the ſun, moon, and planets, which he made with inſtruments much ſuperior to any that had been made before, whence aſtronomers could rely on his obſervations more than thoſe that had been made without the aſſiſtance of teleſcopes. The ſaid Mr. Flamſtead likewiſe compoſed the Britiſh Catalogue, containing about three thouſand ſtars, which is twice the number that are in the catalogue of Hevelius, to each of which he has annexed its longitude, latitude, right aſcenſion, and diſtance from the pole, with the variation in right aſcenſion and declination, while the longitude encreaſes a degree together with moſt of his obſervations.

The great and immortal Sir Iſaac Newton, who, beſides his innumerable other wonderful inventions, has diſcovered the fountain and ſpring of all the celeſtial motions, and the great law which is univerſally diffuſed through the whole ſyſtem of nature, which the almighty and wiſe Creator has commanded all bodies to obſerve, viz. That every particle of matter attracts each other in a reciprocal duplicate proportion of its diſtance.

This law is, as it were, the cement of nature, and the principle of union, by which all things remain in their proper ſtate and order; it detains not only the planets, but the comets, within their due bounds, and hinders them from making excurſions into the immenſe regions of ſpace; which they would do if they were only actuated by a motion once implanted in them, which naturally they would always preſerve, according to the principal law of motion.

We are obliged to the ſame gentleman for the diſcovery of the law that regulates all the heavenly motions, ſets bounds to the planets orbs, determines their greateſt excurſions from the ſun, and their neareſt approaches to him. To this ſublime genius we owe, that now we know the cauſe why ſuch a conſtant and regular proportion is obſerved by both primary and ſecondary planets in their circulations round their central bodies, in comparing their diſtances with their periods; and why all the celeſtial motions are ſtill continued in ſuch a wonderful regularity, harmony, and order. The ſame incomparable perſon having a compleat knowledge of the laws of nature and motion, has from them furniſhed us with a new theory of the moon, which accurately anſwers all her inequalities, and accounts for them by the laws of gravity and mechaniſm; ſo that now the moon's place, computed by the rules of this new theory, which has been corrected by Dr. Bradley's accurate obſervations, does not ſenſibly differ at any time from what it is obſerved to obtain in the heavens, which far exceeds the hopes and expectations of our aſtronomers; ſo that we have now a proſpect of improving our navigation, by finding from obſervations of the moon the longitude of a ſhip at ſea, a problem, the ſolution of which has long been deſired, and is now compleated.

Aſtronomy owes many and great improvements to the indefatigable Dr. Halley, in whoſe labours there ſhines out the greateſt dexterity in practical aſtronomy, and a moſt profound and exquiſite ſkill in geometry: he has favoured the world with the aſtronomy of comets, aſtronomical tables, and a catalogue of the ſouthern ſtars.

The next of the Regius Profeſſors of aſtronomy is Dr. Bradley, whoſe ſuperior merit and abilities in practical and theoretical aſtronomy are well known to the world to excel all that went before, but we hope not all that will follow. 'Tis to this great genius we owe the diſcovery of the nutation of the earth's axis, the aberration of the ſtars, &c. diſcoveries, which in themſelves are ſo minute, that ſome of our modern pretended practical obſervers, whoſe heads and hands are too immechanical for ſuch employment, will never be able to corroborate.

The reverend Nathaniel Bliſs, ſucceſſor to Dr. Bradley, was the next and laſt of the deceaſed Regius Profeſſors; but his ſhort enjoyment of the royal place, and bad ſtate of health, prevented him from letting the world know he was not leſs ingenious than his predeceſſors.

The writers on aſtronomy are Albategnius, Sacro Boſco, Regio Montanus, Purbachius, Lanſbergius, Longomontanus, Clavius, Boyer, Hook, Horrox, Ricciolus, Sir Jonas Moore, Tacquet, Bullialdus, Ward,

Ward, Count Pagan, Wing, Street, De la Hire, Dr. Gregory, Mercator, Whiſton, Keil, the two Caſſini's, Leadbetter, Dunthorn, Hodgſon, Brent, Dr. Long, De la Caille, Wright, Ferguſon, Heath, Kennedy, De la Lande.

Aſtronomy is ſometimes divided into old and new.—The *old* aſtronomy is that which ſuppoſes the earth fixed and quieſcent in the center; and that the heavenly bodies perform their revolutions round it.

The *new* aſtronomy is that which has generally been followed ſince the time of Copernicus, who revived the Pythagorean, or true ſolar ſyſtem. See COPERNICAN *Syſtem*.

ASTROSCOPE, the name of an inſtrument compoſed of two hemiſpheres, with the conſtellations delineated on the ſuperficies.

ASTYNOMI, in antiquity, magiſtrates at Athens, whoſe office was the ſame with that of the ædiles at Rome. See ÆDILE.

ASYLUM, a place of refuge, or ſanctuary: it is compounded, according to Servius, of *α*, priv. and *συλαω*, to draw out, becauſe no one could be taken away by force out of an aſylum.

Aſylums are of very ancient date, both amongſt the Heathens and the Jews: the firſt that we read of, among the former, was one eſtabliſhed at Athens, by the deſcendants of Hercules, to ſhelter themſelves from the fury of his enemies. In the days of Moſes, aſylums were in uſe; for God commanded him to appoint cities of refuge, to which thoſe who had been guilty of particular crimes might eſcape, and continue there unpuniſhed and unmoleſted.

The temples, altars, ſtatues, and tombs of heroes, were of old the ordinary retreat of thoſe who found themſelves aggrieved by the rigour of the laws, or oppreſſed by the violence of tyrants: but of all others, temples were eſteemed the moſt ſacred and inviolable refuge. They ſuppoſed that the gods took upon them to puniſh the criminal who thus threw himſelf upon them, and that it would be the higheſt degree of impiety, to attempt to wreſt vengeance out of the hands of the immortals. Hence aroſe, amongſt the Greeks, a kind of proverbial ſaying, Εχει γαρ καταφυγιον, θηρ μεν πετραν, δουλος δε θειων θεων: "A wild beaſt "has for its aſylum a rock, or den, and ſlaves the "temples of the gods."

It is reported that there were aſylums at Lyons and Vienne, among the ancient Gauls, from which no one durſt attempt to force criminals away: and there are even now ſome cities in Germany, which preſerve the ancient right of aſylum. We meet with the inſcription ΑΣΤΑΟΙ, to which is added ΙΕΡΑΙ, on the medals of ſeveral ancient cities, particularly in Syria: thus for inſtance, ΤΥΡΟΥ ΙΕΡΑΣ ΚΑΙ ΑΣΥΛΟΥ ΣΙΔΩΝΟΣ ΙΕΡΑΣ ΚΑΙ ΑΣΥΛΟΥ. There were formerly in Athens ſix altars or temples, that enjoyed the right of aſylum, viz. the temple of Pity, the temple of Minerva, the temple of the Furies, the temple of Munychia, and the two temples of Theſeus, of which one was within the city, and the other without the walls. Theſe temples afforded a refuge or ſanctuary to malefactors of all kinds, to ſlaves who had fled from their maſters, and to debtors of every denomination, whatever might be the nature or amount of their debts. No one could be forced from theſe retreats; but if it was found that any one who had fled thither, was guilty of premeditated villainy, that the number of crimes might not encreaſe through impunity, he was ſuffered to ſtarve with hunger, or fire was ſet to the place, to oblige him to quit it: hence Euripides makes Andromache ſay to Hermione, πυρ τοι προσοισω.

In the times of Conſtantine and Theodoſius, aſylums were found in the Chriſtian world, the altars and inſides of churches only being places of refuge. Afterwards this privilege was extended to church-yards, the houſes of biſhops and prieſts, the graves and ſepulchres of the dead; nay, even to croſſes, ſchools, monaſteries, and hoſpitals. At length, theſe aſyla, or ſanctuaries, were ſtripped of their immunities, as they contributed only to make guilt more bold-faced and abandoned.

ASYLUM *for penitent Proſtitutes*, commonly called the MAGDALEN-HOUSE, a charitable foundation, which was carried into execution in the year 1758, and does honour to the benevolent and Chriſtian ſpirit of the preſent age. It is intended to reſcue the moſt indigent and helpleſs part of the creation from variety of wretchedneſs; to relieve thoſe unfortunate females who have been ſeduced from their innocence, and prevent them from plunging ſtill deeper and deeper into ſin, till diſeaſe and death put an end to their miſerable beings. As it is impoſſible to conceive any thing more deplorable than a ſtate of guilt and proſtitution, that charity cannot fail of being highly uſeful which is intended to remedy ſuch terrible evils, and provide for the temporal and eternal good of our fellow-creatures. Such a charity is this, of which we are here ſpeaking; a charity that extends its influence to the moſt wretched and abandoned; to thoſe who would otherwiſe be expoſed to the nauſeous breath of brothel ribaldry, and the wanton inſults of ungoverned riot; who are deſerted by their friends, and ſpurned at by the world; poor houſeleſs wretches, ſubject to every miſery that human nature can experience, to ſcorn and penury, to diſeaſe and pain! From this ſhocking condition, they are removed by this excellent charity; and inſtead of continuing the bane of youth, and the peſts of ſociety, are converted into uſeful members of the community, by having an opportunity given them

them of repenting of their crimes, and exercising their talents in some honest and beneficial employment.

This charity is under the direction of a president, four vice-presidents, a treasurer, and committee of twenty-one governors, seven of whom are to be elected yearly. No business is to be transacted except at a general court, which is to consist of at least ten governors, the president, or vice-president, and the treasurer. These general courts are to be held quarterly, viz. on the last Wednesday of March, June, September, and December. A quorum, consisting of five of the general committee, are to sit once a week or oftener, to receive persons petitioning for admittance, inspect the cloathing, furniture, and provisions, examine the conduct of all the officers and servants, &c. A person is qualified to be a governor for life, who shall subscribe twenty guineas, and for one year, who shall subscribe only five. The *Penitents* are distributed into separate wards, over each of which a head is appointed, yet they are all subject to the *Matron*. They are entirely concealed from sight, except when they attend divine worship in the chapel; and can receive no messages, but what are beforehand communicated to the matron. Upon their being guilty any of them of bad behaviour, they are either confined for a time, reprimanded, or dismissed from the society, without a possibility of being admitted again, according to the nature of their crime. Each person is employed in such work and business, as is suited to her ability; and part of the benefit arising from her labour and ingenuity, is allotted to her. The articles in which they are employed, are making their own cloaths, which consist of a light grey uniform; knitting, and spinning; making bone lace, black lace, artificial flowers, and children's toys; winding silk, drawing patterns, making women and childrens shoes, mantuas, stays, coats, &c. After the continuance of any woman in the house for three years, upon her modest and virtuous demeanor, or upon the application of her parents or friends, the governors may discharge her by her own consent; and upon her discharge, the cloaths which she brought along with her into the house, or if they have been sold, their value in money will be returned to her, together with a certificate of her good behaviour. If any woman is placed in a service out of the house, and shall continue one whole year in such service, to the entire approbation of her master and mistress, a gratuity not exceeding two guineas, will be given her by the committee. Upon the good behaviour of the women, the committee will always interest themselves to obtain a reconciliation with their parents and friends, when their contract is cancelled. In short, this scheme seems to be excellently calculated to preserve the lives, the welfare, and the souls of many unfortunate women; to recover those that are lost, and bring them back as well to the community, as to the fold and family of Christ's flock; and as such, cannot fail of meeting with the best wishes and assistance of every true lover of his country, his religion, and his God.

ASSYMMETRY, the want of proportion between the parts of any thing; being the opposite to symmetry.

The word is Greek, and compounded of *a*, priv. *συν*, and *μετρον*, measure.

It is sometimes used by mathematicians to signify incomprehensibility, or when there is no common measure between two quantities or magnitudes.

ASYMPTOTE, in geometry, a line which continually approaches nearer to another, but tho' continued infinitely will never meet with it.

Definition of the ASYMPTOTES. If the right line *a*TA be drawn perpendicular to the axis IT, at one of its extremities, as T, and TA*q* be made equal to the rectangle IDT; having taken T*a* = TA; through the centre C and the points A, *a* draw the lines AC, *a*C, indetermined both ways from the centre; these lines are called asymptotes to the hyperbola, or the opposite hyperbola's.

COROLLARY.

It is evident that the asymptotes to one hyperbola are also asymptotes to the other that is opposite.

PROP. I.

If the ordinate of an hyperbola be produced until it meet the asymptotes in B and G; the rectangle GPB is equal to TA*q*. (See Plate XI. *fig.* 6.)

The lines TA and OB are parallel; wherefore CT*q*: TA*q* :: CO*q*: OB*q*, and CT*q*: TA*q* :: CO*q*—CT*q* = rectangle IOT: OP*q*. and, *ex æquo*, CO*q*, OB*q* :: CO*q*.—CT*q*: OP*q*, and alternately CO*q*. CO*q*. — CT*q* :: O*q*: OP*q*, and, by division, CO*q*: CO*q*— CO*q*+CT*q* = CT*q* :: OB*q*: OB*q* — OP*q*, and alternately CO*q*: OB*q* :: CT*q*: OB*q*— OP*q* = rectangle GPB: but in the first proposition CO*q*: OB*q* :: CT*q*: TA*q*; wherefore the rectangle GBP = TA*q*. *W. W. D.*

PROP. II.

If from some point, as P, in a hyperbola be drawn the right line P*g* parallel to the axis IT, meeting the two asymptotes in *b* and *g*; then is the rectangle *g*P*b* equal to CT*q*.

From the position of the asymptotes, is bisected in O by the axis CM; and from similar triangles, OB*q*:

OBq: (fee *fig.* 6.) COq = POq :: COq, or oPq : $ob\,q$; and by diviſion, OBq : OBq − OPq :: oPq : oPq − $ob\,q$; and alternately, and by inverſion, OBq − OPq = rectangle GPB : oPq − $ob\,q$ = rectangle gPb :: OBq. oPq = COq : but OBq : COq :: TAq : CTq ; wherefore, *ex æquo*, rectangle GPB. rectangle gPb :: TAq. CTq ; but rectangle GPB = TAq. (by the laſt prop.) wherefore rectangle gPb = CTq. *W. W. D.*

PROP. III.

The hyperbola and its aſymptote approach continually to one another the farther both of them are produced, and yet will never meet, though PB, the part of the ordinate contained between the hyperbola and its aſymptote, may be found ſuch, that it ſhall be leſs than any line given.

The rectangle GPB is equal to TAq. (See Plate XI. *fig.* 6.) (by prop. I.) but GB encreaſes the farther it is diſtant from C ; wherefore PB continually diminiſheth ; but it can never become equal to nothing, for then the rectangle GPB would be equal to nothing, which would contradict the foremention'd Prop. wherefore the hyperbola and its aſymptote can never meet : then if a rectangle be made, one of whoſe ſides ſhall be leſs than the given line, which rectangle ſhall be equal to TAq ; the ſum of the two ſides of this rectangle, as GB, being applied within the angle made by the aſymptotes perpendicularly to the axis IT, P the point that divides the ſides of that rectangle will be within the hyperbola (by prop. I.) and conſequently PB is leſs than the given line. *W. W. D.*

PROP. IV.

If two points, as P and A, (Plate XI. *fig.* 7.) be taken in a hyperbola, or one point only in each of the oppoſite hyperbola's, and through theſe points be drawn two right and parallel lines, as PH and AD terminated by one of the aſymptotes, as CD ; in like manner, if through the ſame points P, A be drawn two other lines PF, AB, parallel to one another, and terminated at the other aſymptote CB ; then is the rectangle PH × PF = AD × AB.

Through the points P, and A, having drawn the perpendiculars to the axis EPG, and LAK terminated by the aſymptotes in EG, LK ; the triangles EPF and LAB, PGH and KHD, are ſimilar, by reaſon the lines that compoſe them are parallel ; wherefore EP. PF :: LA. AB, and PG. PH :: AK : AD ; wherefore multiplying theſe two proportions into one another, antecedents into antecedents, and conſequents into conſequents ; there will ariſe this proportion ; EP × PG : PF × PH :: LA × AK : AB × AD ; but the rectangle EPG equal rectangle LAK ; for (by prop. I.) they are equal ſquares of one and the ſame right line ; wherefore the rectangle PF × PH is equal to the rectangle AB × AD. *W. W. D.*

COROLLARY.

It is evident that what we have demonſtrated above for two points only, may be demonſtrated in like manner for any number of points whatſoever.

PROP. V.

If a right line, as FH, (Plate XI. *fig.* 10.) touch an hyperbola in P ; then it meets the aſymptotes in F and H, and is biſected by the point of contact P.

1. Through the point P draw EPO an ordinate to the axis, and if the tangent P do not meet the aſymptotes, it will be parallel to one of them, which let be CG, if it be poſſible. By prop. III. one may find a line leſs than PG, which being parallel to CG, let it be comprehended between the hyperbola and the aſymptote ; this line produced will neceſſarily meet the tangent FPH parallel to CG within the hyperbola, which is abſurd ; for FPH is ſuppoſed to be a tangent ; therefore a tangent meets both the aſymptotes, which is the firſt part of the propoſition.

2. If PH be unequal to PF, let it be greater if poſſible ; having cut off Hp = FP, draw epg parallel to EPG ; then, becauſe pF = Hp, and ge parallel to GE, pg : PG :: Hp : HP ; and Hp : HP, or their equals FP : Fp :: PE : pe, and, *ex æquo*, pg : PG :: PE : pe ; wherefore PG × PE = pg × pe ; and by the converſe of the 9th Prop. the point p will be one of the points of the hyperbola ; therefore FPH will meet the hyperbola in two points P, p, contrary to the hypotheſis, for it is ſuppoſed to be a tangent. Wherefore the Propoſition is true.

PROP. VI.

Through the points P, A of an hyperbola, (Plate XI. *fig.* 9.) draw the right lines FH, BD parallel to one another, and meeting the aſymptotes each of them in the points F, H, B, D ; then the rectangle PF × PH is equal to the rectangle AB × AD or ABq, if BD touch the hyperbola in the point A.

This propoſition is evident from prop. IV. and V. for the lines PF, PH, and AB, AD are parallel ; and if BD be a tangent in the point A, it is divided by the point A into two equal parts (by prop. V.)

ASYMPTOTIC, ſomething relating to aſymptotes. See ASYMPTOTES.

ASYMPTOTIC *Space*, the ſame with hyperbolic ſpace.

ASYNDETON, a figure in grammar, implying the want of conjunctions in a ſentence. It is compounded of the Greek ἀ, priv. and σύνδεω, I bind

bind together: becauſe a ſentence is connected by the uſe of conjunctions.

In the following ſentence, *Veni, vidi, vici*, the copulative *et* is omitted: as alſo in that paſſionate expreſſion of Cicero about Catiline, *Abiit, exceſſit, evaſit, erupit*. This figure is properly applied to expreſs any violent action or emotion of the ſoul: thus for inſtance in Virgil,

Ferte citi flammas, date vela, impellite remos.

When we ſpeak with coolneſs and deliberation, conjunctions are abſolutely neceſſary; and when we would particularize ſeveral things, inſtead of an aſyndeton, we ſhould employ a polyſyndeton, or figure by which the copulatives are multiplied. See POLYSYNDETON.

ATARAXY, a term uſed by the ſtoics and ſceptics to denote that calmneſs of mind which ſecures us from all emotions ariſing from vanity or ſelf-conceit. In this conſiſted the ſummum bonum, or ſovereign good.

The word is Greek, ατραξια, and compounded of α, priv. and ταραξω, perturbation.

ATAXY, in a general ſenſe, the want of order: with phyſicians it ſignifies the irregularity of the criſes and paroxyſms of fevers.

The word is Greek, αταξια, and compounded of α, priv. and ταξις, order.

ATCHE, in commerce, a ſmall ſilver coin uſed in Turky, and worth only one-third of the Engliſh penny.

ATCHIEVEMENT, in heraldry, denotes the arms of a perſon, or family, together with all the exterior ornaments of the ſhield, as helmet, mantle, creſt, ſcrolls, and motto, together with ſuch quarterings as may have been acquired by alliances, all marſhalled in order.

ATE, in the pagan theology, the goddeſs of miſchief.

She was the daughter of Jupiter, and caſt down from heaven at the birth of Hercules: for Juno having deceived Jupiter, in cauſing Euriſtheus to be born before Hercules, Jupiter expreſſed his reſentment on Ate, as the author of that miſchief, and threw her headlong from heaven to earth, ſwearing ſhe ſhould never return thither again.

The name of this goddeſs comes from ατα, *noceo*, to hurt. Her being the daughter of Jupiter means, that no evil happens to us, but by the permiſſion of Providence; and her baniſhment to earth denotes the terrible effects of divine juſtice among men.

ATELLANÆ, in Roman antiquity, comic and ſatyric pieces preſented on the theatre; but as in the later times they grew exceſſively lewd, they were ſuppreſſed by order of the ſenate.

A TEMPO GIUSTO, in muſic, ſignifies to ſing or play in an equal, true, and juſt time.

ATHAMADULET, the prime miniſter of the Perſian empire, as the grand vizier is of the Turkiſh empire.

The athamadulet is great chancellor of the kingdom, preſident of the council, ſuperintendant of the finances, and is charged with all foreign affairs.

ATHANASIAN CREED, that ſuppoſed to be compoſed by Athanaſius. See CREED.

ATHANATI, in Perſian antiquity, a body of cavalry, conſiſting of ten thouſand men, always complete. They were called athanati, becauſe when one of them happened to die, another was immediately appointed to ſucceed him.

ATHANOR, in chemiſtry, a kind of fixed and large digeſting furnace, made with a tower, ſo contrived as to keep a conſtant moderate heat for a conſiderable time, which may be increaſed or diminiſhed at pleaſure, by ſhutting the regiſters.

Plate XIII. *fig.* 3. repreſents an athanor furnace, *aaaa*, the tower of the athanor, or chief furnace, which receives the fuel of the fire: the pricked lines indicate the thickneſs of the wall: *bbbb*, the inner ſides which form the cavity, and are each ten inches long; *c*, the door of the aſh-hole; *e*, the upper-door; *d*, the grate which is placed even with the bottom of the door *e*; *f*, the cover wherewith the upper aperture of the tower is ſhut; *gg*, a flue, through which the fire aſcends from the tower into the firſt furnace; *hhhh*, a hollow priſm, which forms the firſt ſecondary furnace; *ii*, a ſemi-cylindrical arch, wherewith the aforeſaid priſm is cloſed up; *kkkk*, an iron plate coated within, wherewith the firſt ſecondary furnace is ſhut. In this plate is a round hole, through which the neck of the veſſel 7 may be paſſed; *n*, iron-bars; *oooo*, iron-hooks, faſtened to the wall to receive the iron-bars; *qqqq*, the funnel of the furnace; *x*, an iron plate, wherewith the funnel may be ſhut; *tt*, another flue, through which the fire paſſes from the firſt ſecondary furnace to the ſecond; *uuuu*, another ſecondary furnace cylindrical; *vv*, its upper circular aperture, ſloped at the fore-part, to receive an iron pot, which is to be hung in this ſecondary furnace; *z*, a flue, which conveys the fire from the ſecond to the third furnace; 1111, the third ſecondary furnace, having an iron pot, like the ſecond; 2222, the ſecond funnel; 3, a plate to ſhut the funnel; 4, an aperture which leads from the third furnace into the funnel; 555, the third funnel; 7, an earthen retort, placed in the firſt ſecondary furnace, with its neck through the hole in the door; 8, a receiver; 9, a glaſs retort, placed in the iron pot belonging to the ſecond ſecondary furnace, which pot is filled with ſand; 10, a receiver; 11, a glaſs cucurbit, with its head placed in the pot of the third furnace; 12, 12, ſtands which ſupport the receivers, and which may be raiſed or lowered by the help of ſcrews.

Uſes of the ATHANOR.—You muſt put in, at the

the upper arch-door *e*, a ſemi-cylindrical muffle, twelve inches long, of the ſame height and breadth of the door, three quarters of an inch thick, and open behind, being ſhut there by the hinder part of the athanor: for this purpoſe, a tile muſt be placed on the grate *d*, to ſupport the muffle. Under this muffle you may place your cement-pots, or ſuch bodies as muſt be calcined with a long and violent fire; which may be done without a muffle, though not ſo well. In the firſt ſecondary furnace, *hhhh*, *ii*, you may perform the moſt violent diſtillations with an open fire; for retorts and other veſſels may be introduced into it, by taking away the door *kkk*, and placed either upon the hearth itſelf, or on a particular ſupport of ſtone: but you muſt be careful to place thoſe veſſels in ſuch a manner, that their necks may paſs through the hole in the door *kk*. You may cloſe all the crevices of the door with lute. To the neck of the retort apply a cylindrical ſegment ten or twelve inches long, that the heat of the vapours may be gradually diminiſhed, leſt the receiver, which muſt be of glaſs, ſhould ſplit. The receiver muſt be luted to the other orifice of the ſaid ſegment, and ſupported by a kind of trivet. In this chamber, inſtead of diſtillations, you may make cementations, calcinations, &c. in which caſe the round hole in the iron plate *kk*, muſt be ſhut.

The ſecond and third ſecondary furnaces ſerve chiefly to perform ſuch operations as are made in baths of ſand, aſhes, or filings. You may alſo make in theſe furnaces diſtillations by a reverberating fire, as in the firſt; only the fire is leſs violent in theſe, though ſufficient for diſtilling aqua-fortis. In order to this, you muſt take out the iron pot, and invert it on the mouth of the furnace; by this means the ſegment cut out from the pot, together with that cut out from the ſide of the cavity, will form a hole for the neck of the retort.

All the apparatus being thus prepared, you muſt introduce, through the top of the tower *kkkk*, a few burning coals, and then a ſufficient quantity of fuel, ſo that the tower may be entirely filled, or only in part, according to the nature of the operation. Then immediately put on the iron cover *f*, and cloſe exactly all the crevices with lute; for if you neglect this caution, all the fuel contained in the tower would immediately be kindled, which might be attended with very bad conſequences.

Manner of regulating the Fire.—The fire may be made very ſtrong in the firſt chamber *hhhh*, *ii*, by leaving the door of the aſh-hole *c*, and the funnel *qqqq*, of the chamber, quite open, and the fire have free liberty to paſs from the tower into this cavity: but the cloſer the funnel is ſhut, together with the door of the aſh-hole, the more the violence of the heat diminiſhes; and this will be ſoon effected, if the iron ſlider, which ſeparates this cavity from the tower, be partly let down. Obſerve alſo, when the ſtrongeſt fire is required, that the hole in the door *kk* be cloſely ſtopped; becauſe, when open, the air, by ruſhing violently through it, cools the bodies placed in that cavity. At the ſame time, diſtillation, or ſome other proceſs, may be performed, and with the ſame fire, in the ſecond and third furnaces; for the fire penetrates from the firſt cavity into the ſecond, and increaſes when the funnel 2222, erected on it, is opened: but, before you do this, the funnel of the firſt cavity muſt be ſhut as much as that of the ſecond is opened. By the ſame means you may hinder the fire, which ſerves for the operations made in the two firſt cavities, from going out through their funnels, and force it out through the funnel 555, by which means it will alſo act upon the bodies placed in that cavity: for the more the funnel erected on the third cavity is open, the more one or both the funnels of the other cavities muſt be cloſed: whence it is plain, that you cannot have the ſtrongeſt fire in the third cavity, unleſs there be an equal degree of fire in the other two; but, on the contrary, the heat in the third cavity may be rendered leſs, by cloſing its funnel, though it be violent in the others. The ſame is true of the ſecond cavity, with regard to the firſt. You cannot make the ſtrongeſt fire under the muffle placed within the upper door *e*, of the tower, unleſs you have an equal fire in the firſt cavity; which fire may conſequently be increaſed by ſhutting the door quite againſt the muffle, and diminiſhed by opening it; there being, at the ſame time, an equal heat in the firſt and following chambers.

ATHEIST, one who diſbelieves the being and providence of God. It is derived from the Greek ἀ priv. and θεὸς, a God.

We may diſtinguiſh our modern atheiſts into two kinds; *ſpeculative atheiſts*, or thoſe who, thro' a pride or ſingularity of learning, affect to deny the exiſtence of a God, from theory or principle, as they would make us believe; and *practical atheiſts*, or thoſe whoſe wicked lives lead them to believe, I mean, to wiſh that there may be no God. It is to be doubted whether there ever yet exiſted one ſenſible reaſoning perſon who actually, and in his heart, entertained a diſbelief of a Providence: it is to be doubted, I ſay, and for this reaſon; becauſe the whole creation, rational and irrational, animate and inanimate, bear teſtimony to the great and important truth. That *fools have ſaid in their hearts there is no God*, is not altogether ſo improbable; as they are incapable of examining any thing with attention, or employing thoſe faculties properly with which nature has inveſted them. The eyes of their mind are darkened, ſo that they cannot ſee the cleareſt and moſt glaring truths; and they

they pass their time in a dull inactivity of reason and soul, that degrades and debases them below the brutes.

ATHELING, ADELING, EDLING, ETHLING, or ETHELING, among our ancestors, was a title of honour belonging to the heir apparent, or presumptive, to the crown. This honourable appellation was first conferred by Edward the Confessor on Edgar, to whom he was great uncle, when, being without any issue of his own, he intended to make him his heir.

ATHENÆA, in antiquity, a feast celebrated by the ancient Greeks in honour of Minerva, who was called Athene.

ATHENÆUM, in antiquity, was a public structure wherein the professors of the liberal arts held their assemblies, the rhetoricians declaimed, and the poets rehearsed their performances.

These structures, of which there were several at Athens, were built in the form of amphitheatres, encompassed with seats, called cunei.

ATHEROMA, in surgery, a tumour without pain or discoloration of the skin, containing, in a membraneous bag, matter resembling pap, intermixed with hard and stony particles. These tumours are easily cured by incision.

The word is Greek, αθερωμα, and derived from αθηρα, pulp, or pap.

ATHLETÆ, in antiquity, persons of strength and agility, properly disciplined for performing in the public games.

The word is Greek, αθλητης, and derived from αθλος, combat.

Under the name athletæ were comprehended wrestlers, boxers, runners, leapers, throwers of the discus, and those practised in other exercises exhibited at the Olympic, Pythian, and other solemn games, where prizes were established for the conquerors.

ATHWART, in the marine, across; as, We discovered a fleet at day-break standing athwart us, i. e. discovered a fleet steering across the line of our course.

ATHWART *hause*. When a ship is driven by the wind or tide against the fore-part of another, and presses upon it with her side, she is then said to lie athwart-hause of the latter.

ATHWART *the fore foot*: a shot is commonly fired immediately before a ship's fore-part by another of superior force, when she wants to intercept her, that she may remain with her sails slackened until she is examined; and this is called firing athwart the fore-foot.

ATHWART *Ships*, reaching across the ship, or from one side to the other.

ATLANTIDES, in astronomy, the same with Pleiades. See PLEIADES.

ATLAS, in anatomy, the name of the first vertebræ of the neck, or that which supports the head. It has its name from an allusion to a celebrated mountain in Africa, of so stupendous a height, that it seems to support the heavens; and from the fable, in which Atlas, king of that country, is said to bear the heavens upon his shoulders.

ATLAS, in architecture, is a name given to those whole or half figures of men, sometimes used instead of columns or pilasters to support any member in architecture. They are sometimes called Telamones.

ATLAS, in matters of literature, denotes a book of universal geography, containing maps of all the known world.

ATMOSPHERE is a thin elastic fluid, intermixt with particles of different natures surrounding our globe to the height of about forty or forty-five miles. The nature and properties of this fluid, we have shewn under the article AIR. But some of its uses we shall now point out, and first as to Vegetation, Dr. Grew and Malphighi have shewn that it is a principal concurrent therein, and by experiments on seeds sown in earth and put in an exhausted receiver, it has been proved that no vegetation can succeed without it; what makes it so necessary seems to be, because it being more easily rarefied, and heated by the action of the sun than other more compact, heavy, and less springy fluids, is fitter to promote the ascent of juices in the slender channels of vegetables; and there being no fluid without a considerable portion thereof, lodged up and down among its parts, the first impulse of the juices upwards does thence arise. As also because of its active, springy, and subtile nature, it rarefies, actuates, and refines the more fizy vegetable juices to promote their circulation, and performs functions on them analogous to that it does on the animal fluids. Next, as to animals, it is well known that they could live but a few minutes without this elastic fluid, and probably that which so suddenly kills thunder-struck animals, is the quick and violent rarefaction of the air about them; for the lungs of all such, upon opening, are found quite destitute of air, and the sides of their vesicles quite clapped together. It is certain that the blood is sent from the right ventricle of the heart to the lungs, and if the vesicles thereof be not distended or blown up by the air, the circulation must stop there, and the animal perish; and both for the comminution of the particles of the blood, that they may more easily pass through the capillary and terminating vessels, and for the propagation thereof in the wider ones, there is necessarily required a fluid of a determinate gravity and elasticity. We have as great difficulty in breathing, in a thin (as is evident from the dificulty of breathing on the tops of high mountains, and from experiments on animals in nearly exhausted

exhauſted receivers) as in a thick air; and even in fiſhes, where the water in ſome meaſure ſupplies the want of air, yet if you draw out all the bubbles of air which are always found in water, they will languiſh and die; and in great froſts, if the ice be not broken to admit freſh air, the fiſh in lochs and ponds will languiſh and die, not to mention here their ſwimming-bladders, which are ſo neceſſary to them, and communicates with the air in their gills. So that even to them, a certain portion of this elaſtic fluid is neceſſary. Now how well is this fluid fitted for the generality of the inhabitants of this globe? it being neither too heavy, nor too light, neither too much, nor too little elaſtic, for the uſes of reſpiration. Another advantage we reap by our atmoſphere, is, that by it our clouds and vapours are ſupported, without which we ſhould neither have freſh water, nor ſnow, nor rain, nor any of thoſe things which moiſten and enrich our ſoil, and make it fit for vegetation. For though it be the ſun that rarefies the water, and makes it take its firſt flight in vapours and ſteams; yet it is by the atmoſphere, its progreſs is continued to the upper regions, and ſupported when it is there, to be afterwards formed into ſnow, or hail, or rain, or carried into other regions, whoſe ſoil may want it more. Every body knows, that if there were no atmoſphere, but a perfect void, around the earth, the action of the ſun would not be able to raiſe the vapours above a few feet from its ſurface; and that it is only the atmoſphere's being ſpecifically heavier than theſe vapours, that buoys them up in the air, by its greater tendency toward the center. Now then, if there were no atmoſphere, the vapours could riſe to no ſufficient height, and ſo could never be cooled ſufficiently, ſo as to be formed into ſnow, or rain; for at a ſmall diſtance from the earth's ſurface, the reflected rays of the ſun make the places ſo warm, that no vapour could be turned into ſnow, or rain, there; for it is the coldneſs of the upper regions, (being deſtitute of theſe reflected rays) and the length of their deſcent, that forms theſe clouds and vapours into ſnow and rain. Whenever the ſupporting atmoſphere becomes lighter than theſe accumulated vapours, they fall down with the temper of heat or cold they had in the upper regions, and ſo become ſnow or rain accordingly. So that it is plain, it is our atmoſphere that is one of the principal means of our dews and rains, and all the bleſſings that follow upon theſe. A third advantage of our atmoſphere is, our breezes and our winds, which carry our ſhips upon the ſea, and purify our air from noxious ſteams, which (with the concurrence of the ſun) melt our ſnows, and dry our ground when over-moiſtened; and ſerve for ſo many other purpoſes, for the accommodation of human life. Wind is nothing but a violent motion of the air, produced principally by its rarefaction, more in one place than another, by the ſun's beams, the attractions of the moon, and the combinations of the earth's motions. Without our atmoſphere, we ſhould have no more wind above than under ground, and ſo be deprived of all the benefits ariſing thence. Laſtly, Our atmoſphere is the vehicle and medium of ſound, that ſenſe which moſtly diſtinguiſhes us from fiſhes, and the inferior ſort of inſects. Sound is nothing but a modulation or percuſſion of the air, communicated by an impulſe from the vibrating ſonorous body, and propagated in undulations, through the fluid of the atmoſphere, every way round. Without our air we ſhould not be able to hear the report of a thouſand pieces of ordnance diſcharged at the ſmalleſt diſtance, as is evident from the experiments on ſounds in exhauſted receivers. We ſhould have no ſuch thing as languages or muſic, and what a comfortleſs ſtate this would be, we leave the reader to judge. Add to all theſe, that it is to our atmoſphere the beauty, variety of colours and figures, which are painted on the ſkies, the lightſomeneſs of our air, and the twilight are owing. By it the day is protracted, and the night ſhortened, and in theſe places moſt, which want thoſe moſt. By the refractions of our atmoſphere, the ſun riſes ſooner, and ſets later in appearance, and with its beneficial conſequences, even a month ſooner in ſome places than it would otherwiſe; and the land and mountains appear ſooner to the weary wandering ſailor. Theſe are great and noble advantages to the inhabitants of this globe, as they beſt can tell, who by accidents are ſometimes deprived of them. From all which, it is very plain that there was counſel and deſign in the contrivance and production of our atmoſphere.

Weight of the ATMOSPHERE upon every ſquare inch on the ſurface of the earth, is about fifteen pounds, being equal to a column of mercury whoſe height is thirty inches, and its baſe one ſquare inch; for ſuch a column of mercury would weigh about fifteen pounds. The weight of the atmoſphere therefore which preſſes upon a man's body, is equal to ſo many times fifteen pounds, as the ſurface of his body contains ſquare inches. The reaſon why a perſon ſuffers no inconveniency from ſo great a preſſure, is owing to the air included within the pores and fluids of the body, which by re-action proves a counterpoiſe to the preſſure of the external air.

ATMOSPHERE *of the Moon and Sun.* See MOON and SUN.

ATOM, in philoſophy, an indiviſible particle, or corpuſcle of matter.

The word is Greek, ατομος, and compounded of α, priv. and τεμνω, to cut, or divide.

Atoms are properly the *minima naturæ*, the leaſt or ultimate particles into which bodies are diviſible; and are conceived to be the firſt rudiments, or com-

ponent parts of all physical magnitude; or the pre-existent and incorruptible matter whereof bodies are formed.

The notion of atoms arises from a supposition, that matter is not divisible *ad infinitum*. And hence the Peripatetics are led to deny the reality of atoms. An atom, say they, either has parts, or it has not: if it has no parts, it is a mere mathematical point; if it has, these parts must also consist of others, and so on to infinity.

But this is to recede from the genuine characters of atoms, which are not esteemed indivisible from their want of parts (for all physical magnitude must have three dimensions, length, breadth, and thickness, and all extension is divisible); but they are indivisible on account of their solidity, hardness, and impenetrability, which preclude all division, and leave no vacancy for the admission of any foreign force to separate or disunite them.

It is necessary that atoms, as being the first matter, should be indissolvible, in order to their being incorruptible. Sir Isaac Newton adds, that immutability is also requisite, in order to the world's continuing in the same state, and bodies being of the same nature now as formerly.

Hence the ancients were also led to maintain that atoms were eternal; for what is immutable must be eternal.

ATOMICAL *Philosophy*, the doctrine of atoms; or the method of accounting for the origin and formation of things from the supposition of atoms being endued with gravity and motion. See CORPUSCULAR *Philosophy*.

ATONY, in physic, a relaxation, or debility of the solids of the human body.

The word is Greek, ατονια, and compounded of α, priv. and τονος, tone.

The Methodic sect considered relaxation and stricture, or a mixture of these, as the causes of all distempers.

ATRA BILIS, black bile, among the ancient physicians, implied one of the humours of the body; the moderns call it melancholy. See MELANCHOLY.

ATRACTYLIS, distaff thistle, in botany, a genus of plants bearing radiated flowers, containing many hermaphrodite florets, which are included in a common scaley empalement; the seeds are compressed, coronated with a plumose down, and standing on a plane villose receptacle.

ATRACTYLIS is also the name by which Vaillant calls a species of the carthamus. See the article CARTHAMUS.

ATRAGENE, in botany, a genus of polyandrious plants, the flower of which consists of twelve petals, containing a number of short filaments with oblong antheræ; it hath several oblong germina, which produce a number of caudated seeds.

ATRAPHAXIS, in botany, a genus of hexandrious plants, the flower of which consists of two roundish, sinuated, and premanent petals; it hath six capillary filaments, with roundish antheræ, and the calyx, which is premanent, contains a compressed seed.

One of the species of atraphaxis is called atriplex by Tournefort. This is a shrub which rises about four or five feet high, sending out many weak lateral branches, which are armed with spines; these are furnished with small lanceolated leaves of an ash-colour, and are smooth; the flowers come out of the ends of the shoots in clusters, which consist of two white leaves, tinged with purple, and are included in a two leaved empalement, of a white herbaceous colour; they appear in August. This plant is propagated by cuttings, and must be protected from hard frosts.

A-TRIP, in the marine, a ship's top-sails are said to be a-trip, when they are drawn up to the mast-head, or to their full extent. See TOP-SAIL.

A-TRIP, the anchor is so called, when the ship, in a perpendicular direction, drags or heaves it off the ground.

ATRIPLEX, orach, in botany, a genus of polygamious plants, whose flowers are female and hermaphrodite, with no petals; the female flowers have a two leaved empalement, which are plane, large, upright, and pointed in the center: it has a compressed germen, supporting a bipartite style, crowned with a sharp reflexed stigma. The hermaphrodite flowers have a pentaphyllous calyx, which is persistent, and contains five subulated filaments, placed opposite the leaves of the empalement, supporting a double roundish antheræ: the germen is orbiculated, and contains a style like the female, and in both becomes an orbicular compressed seed inclosed in the empalement.

Atriplex is esteemed cooling and emollient, and its seeds, given internally, diuretic, and good in disorders of the uterus.

ATROPA, deadly night-shade, in botany, a genus of pentandrious plants. The common sort, which grows wild in several parts of England, hath a perennial root, which is long, thick, and brown, and sends forth strong herbaceous stalks, which rise to the height of about three or four feet, purple at the bottom, and of a pale-green upwards; thick, hairy, and divided into a few branches: the leaves are numerous, oblong, hairy, of a faint green, and placed irregularly on the branches; the flowers rise from the bosoms of the upper leaves, and are large and campanulated, spreading at the top, which is cut into five segments, of a dusky greenish colour, striated and stained in various degrees with a dull purple; the base within is yellowish, and the upper part purple; from the base of the petal ariseth five subulated filaments, which are topped with large antheræ, which stand upwards; the style is slender,

ſlender, and a little bent; it riſes from a roundiſh rudiment of a berry, crowned with an oblong ſtigma, placed tranſverſely; the flowers are ſucceeded by a large round berry, a little flatted at top, which is firſt green, but when ripe turns to a ſhining black, ſitting cloſe upon the empalement, and containing three cells filled with kidney-ſhaped ſeeds.

This plant is rarely admitted into gardens, nor indeed ſhould it be ſuffered to grow in any places where children reſort, for it is a ſtrong poiſon, and there have been many inſtances of its deadly quality, by ſeveral children being killed by eating the berries, which are of a fine black colour, about the ſize of a black cherry, and not unpleaſant to the taſte. Buchanan, in his Hiſtory of Scotland, gives an account of the deſtruction of the army of Sweno the Dane, when he invaded Scotland, by mixing a quantity of the juice of theſe berries with the drink, which the Scots by their truce were to ſupply them with; which ſo intoxicated the Danes, that the Scots fell upon them in their ſleep, and killed the greateſt part of them; ſo that there were ſcarcely men enough left to carry off their king. With theſe bad qualities it poſſeſſes alſo great virtues, which were known among the antients, though at preſent little noticed. Mathiolus mentions the uſe of deadly night-ſhade internally, in the diſtilled water, againſt inflammations of the viſcera, and in a ſyrup from the juice of the berries; as alſo outwardly, in various inflammatory ſwellings. In the writings of thoſe who firſt deſcribed this plant, it is ſtrongly recommended as a cure for cancers, though this article has been long over-looked, as it was dreaded as a poiſon, while neglected as a remedy: but later experience has proved, that it hath not the deſired effect.

ATROPHY, in phyſic, implies an univerſal conſumption, proceeding from the whole habit of body, and not from any diſtemper of the entrails; it is attended with no remarkable fever, and is natural in old age.

The word is Greek, ατροφια, and compounded of α, priv. and τρεφω, to nouriſh.

An atrophy is either nervous, or the effect of immoderate evacuations. A nervous atrophy is that which owes its origin to a bad and morbid ſtate of the ſpirits, or to a weakneſs or deſtruction of the tone of the nerves; whence a weakneſs and an univerſal conſumption of the body proceeds, for want of a proper aſſimilation of the nutritious juices; ſo that, from the beginning of the diſeaſe, there is a defect of appetite, and a bad digeſtion in the ſtomach.

An atrophy from inanition proceeds from a preternatural defect or ſubtraction of the nutritious juice, which varies according to the different outlets of the body, whether by nature or art. See CONSUMPTION.

ATTACHMENT, in law, implies the taking or apprehending a perſon, by virtue of a writ or precept.

It is diſtinguiſhed from an arreſt, by proceeding out of a higher court by precept or writ; whereas the latter proceeds out of an inferior court by precept only. An arreſt lies only on the body of a man; whereas an attachment lies often on the goods only, and ſometimes on the body and goods.

An attachment by writ differs from diſtreſs, in not extending to lands, as the latter does; nor does a diſtreſs touch the body, as an attachment does.

In the common acceptation, an attachment implies the apprehenſion of a man's body, in order to his anſwering the action of the plaintiff.

ATTACHMENT *out of the Chancery* is obtained upon an affidavit made, that the defendant was ſerved with a ſubpœna, and made no appearance; or it iſſueth upon not performing ſome order or decree. Upon the return of this attachment by the ſheriff, *quod non eſt inventus in balliva ſua*, another attachment, with a proclamation, iſſues; and if he ſtill refuſes to appear, a commiſſion of rebellion.

ATTACHMENT *of the Foreſt* is one of the three courts held in the foreſt.

The loweſt court is called the court of attachment, or wood-mote court; the mean, ſwan-mote; and the higheſt the juſtice in eyre's ſeat.

The court of attachments has its name from the verdurers of the foreſt having no other authority in it, but to receive the attachments of offenders againſt vert and veniſon taken by the foreſters, and to enroll them, that they may be preſented or puniſhed at the next juſtice in eyre's ſeat.

This attachment is by three means; by goods and chattels, by body, pledges, or mainprize; or by the body only. This court is held every forty-days throughout the year; and is thence called forty-days court.

ATTACHMENT *of Privilege* is by virtue of a man's privilege to call another to that court whereto he himſelf belongs, and in reſpect whereof he is privileged to anſwer ſome action.

Foreign ATTACHMENT is an attachment of money or goods found within a liberty or city, to ſatisfy ſome creditor within ſuch liberty or city.

By the cuſtom of London, and ſeveral other places, a man can attach money or goods in the hands of a ſtranger, to ſatisfy himſelf.

ATTACHIAMENTA *Bonorum*, in our old ſtatute books, imports a diſtreſs taken upon the goods or chattels of a perſon ſued for a perſonal eſtate, or debt,

debt, by the legal attachiators, or bailiffs, as a ſecurity to anſwer the action.

ATTACHIAMENTA *de Spinis & Boſco*, denotes an ancient privilege granted to the officers of foreſts, to take to their own uſe thorns, bruſh, and windfalls within their own precincts or liberties.

ATTACK, a violent attempt upon any perſon or thing, an aſſault, or the act of beginning a combat, or diſpute.

ATTACK, in the military art, is an effort made to force a poſt, break a body of troops, &c.

ATTACK *of a Siege*, is a furious aſſault made by the beſiegers with trenches, covers, mines, &c. in order to make themſelves maſters of a fortreſs, by ſtorming one of its ſides. If there are two or three attacks made at the ſame time, there ſhould be a communication betwixt them.

ATTAINDER, in law, is when a man has committed felony or treaſon, and ſentence is paſſed upon him for the ſame. The children of a perſon attainted of treaſon, are thereby rendered incapable of being heirs to him, or to any other anceſtor; and if he were noble before, his poſterity are degraded and made baſe: nor can this corruption of blood be ſalved, but by an act of parliament, unleſs the ſentence be reverſed by a writ of error.

Attainder is two-fold, either by appearance, or by proceſs.

ATTAINDER by appearance, is either by battle, by confeſſion, or by verdict. By battle, is when the party appealed by another, chooſing rather to try the truth by combat than by jury, is vanquiſhed. Attainder by confeſſion, is either by pleading guilty at the bar, and not putting himſelf upon trial by the jury, or before the coroner in ſanctuary, where, in ancient times, he was obliged to renounce the realm.

ATTAINDER by verdict, is when the priſoner at the bar pleads not guilty to the indictment, and is pronounced guilty by the jury.

ATTAINDER by proceſs, otherwiſe called attainder by default, is where a party flies, or does not appear after being three times publicly called in the county court, and at laſt, upon his default, is pronounced guilty.

Bill of ATTAINDER, a bill brought into parliament for attainting, condemning, and executing a perſon for high treaſon.

ATTAINT, in law, a writ which lies againſt a jury that have given a falſe verdict in any court of record, in a real or perſonal action, where the debt or damages amount to above forty ſhillings.

If the verdict be found falſe, the judgment, by common law, was, that the jurors meadows ſhould be ploughed up, their houſes broken down, their woods grubbed up, all their lands and tenements forfeited, &c. but by ſtatute the ſeverity of the common law is mitigated, where a petty jury is attainted, and there is a pecuniary penalty appointed.

But if the verdict be affirmed, ſuch plaintiff ſhall be impriſoned and fined.

ATTAINT, among farriers, a knock or hurt in a horſe's leg, proceeding either from a blow with another horſe's leg, or from an over-reach in froſty weather, when a horſe being rough-ſhod, or having ſhoes with long calkers, ſtrikes his hinder feet againſt his fore-legs.

ATTAINTED, in law, is applied to a perſon found guilty of any crime or offence, eſpecially of treaſon or felony, by due courſe of law.

ATTENTION, the applying either the ear or the mind aſſiduouſly to any thing ſaid or done, in order to underſtand it.

The word is Latin, *attentio*, and compounded of *ad*, to, and *tendo*, to ſtretch, or bend.

To increaſe attention, we muſt baniſh every thing that may interrupt it, and ſeek every means to ſtrengthen and aſſiſt it. Our ſenſes are apt to divert our attention; new ſenſations obſcure, efface, and obliterate acts of imagination. Yeſterday you ſaw a fine piece of painting, were ſo ſtruck with it, that its idea quite poſſeſſed you; another, offered to your view to-day, drives the former out of your imagination; thus external objects deſtroy attention: for this reaſon ſome pray with their eyes ſhut, or directed ſteadily towards ſome fixed and immoveable point. Students chooſe a room remote from noiſe and the interruption of external objects; and the ſtudies of the night have been more ſucceſsful than thoſe of the day, becauſe a more univerſal calm and ſilence reigns.

The hurry of the imagination deſtroys attention as much as that of our ſenſes; after a play, it is difficult to reſume our ſtudies immediately; next day ſome images will recur, apt to divert us, and interrupt our attention. The ſenſes, the imagination, and the paſſions operate upon the ſoul, and give it a kind of modification. All, therefore, who would apply themſelves ſtrenuouſly to the diſcovery of truth, ſhould be careful to avoid ſtrong and immoderate ſenſations, a great noiſe, a glaring light, exceſs of grief, or joy, &c. they ought to keep their imagination free from any thing that weakens or diſquiets the mind. They ought eſpecially to control their paſſions, which, let looſe, make very powerful impreſſions on the ſoul and body, and exerciſe a ſtrange dominion over both; yet the paſſions and the ſenſes may be made of uſe to preſerve our attention: as, for inſtance, a deſire of diſcovering truth, rendering ourſelves uſeful to our neighbours, and improving ourſelves, is highly laudable, and tends to fix our attention;

but our attention is fixed also by motives much less generous and noble, a thirst of fame, desire of riches, nay, even vanity. Experience shews us the senses are of no small service to fix the attention; for they have a natural connection with our situation; a man, retired to meditate in a solitary cell, will be alarmed, distracted, and his attention entirely destroyed by an unexpected noise, or intermission of adventitious light; so, if we, on the contrary, reflect strongly on an object amidst daylight and noise, that idea banishes all others and possesses us; thus light and noise are no interruptions to attention, but serve to fix it more strongly. It is, in short, a habit of the mind: and the philosophers, who have shut their eyes to help their meditation, have furnished us with nothing but chimeras. Had Descartes kept his eyes open to have surveyed the universe with attention, instead of sinking into meditation, he would never have published such dreams as he has for a plan of the universe. Attention is progressive, and the power of it may be acquired, but depends, in some measure, on the constitution.

ATTENUANTS, in pharmacy, are medicines which resolve the viscosity of the humours in the human body, and thereby promote their free circulation, and, at the same time, discharge all noxious and excrementitious matter.

The word is formed from the Latin, *ad*, and *tenuo*, to render small.

ATTESTATION, the act of affirming, or witnessing, the truth of something, especially in writing.

The word is Latin, *attestatio*, and compounded of *ad*, to, and *testis*, a witness.

ATTIC, something relating to Attica, or the city of Athens. Thus, Attic salt, *sales Attica*, implies a delicate and poignant species of wit and humour peculiar to the Athenian writers: Attic witness, *Atticus testis*, a witness incapable of corruption, &c.

ATTIC, in architecture, a sort of building; the roof or covering of which is concealed; so called from the Athenian buildings, which were in general of this form.

ATTIC *Order*, in architecture, a small order raised upon a large one, by way of crowning, or to finish the building.

The word is also applied to the whole story into which this order enters.

ATTIC *of a Roof*, a kind of parapet to a terrace, platform, or the like.

ATTIC *Continued*, that which encompasses the whole circumference of a building, without any interruption, following all the jetts, the returns of the pavilions, &c.

ATTIC *Interposed*, one situated between two tall stones, sometimes adorned with columns, or pilasters.

ATTIC *Base*. See the article BASE.

ATTIRE, in botany, a name given by some to the generative parts of plants; and by others, to imply the third part or division of the flower of a plant; the other two being the empalement and the foliation, or the cup and the flower petals.

ATTIRE, in hunting, signifies the head or horns of a deer. See the article HEAD.

ATTITUDE, in painting and sculpture, signifies the gesture of a figure or statue; or such a disposition of their parts as serves to express the action and sentiments of the person represented.

The word is formed from the Italian, *attitudine*, which signifies the same thing.

ATTOLLENS, in anatomy: see LEVATORES and ELEVATORES.

The word is compounded of the Latin, *ad*, to, and *tollo*, to raise.

ATTORNEY, in a general sense, a person appointed by another to do something in his stead.

The word is formed from the Latin, *ad*, to, and the French, *tourner*, to turn; q. d. to turn a business over to another.

ATTORNEY *at Law*, one who is retained to prosecute or defend a law-suit.

Attornies, being properly those who sue out writs, or process, or commence, carry on, and defend actions, in any of the courts of common law, are distinguished from solicitors, as the latter do the like business in the courts of equity; and none are admitted, either as an attorney or solicitor, unless they have served a clerkship of five years, been enrolled, and taken the oath in that case provided; and the judges of their respective courts are required to examine their several capacities.

By a late order of all the judges, all attornies are to be admitted of some inns of court or chancery (except house-keepers in London and Westminster, &c.); and no attorney shall put himself out of that society, into which he is admitted, till he is admitted to some other society, and deliver a certificate thereof; and all attornies are to be in commons at the times ordered by the society to which they belong, otherwise they shall be put out of the roll of attornies.

Attornies may be punished for ill practices; and if an attorney, or his clerks, of which he must have but two at one time, do any thing against the express rules of the court, he or they may be committed.

Neither a plaintiff nor defendant may change his attorney without rule of court, while the suit is depending; and attornies are not generally obliged to deliver up the writings in their hands, till their fees are satisfied: likewise, an action does not lie against an attorney, for what he advises in

the way of his profeſſion; yet, if an attorney plead any plea, or appear, without warrant from his client, action of the caſe lies againſt him.

Attornies have the privilege to ſue and be ſued only in the courts of Weſtminſter, where they practiſe; and they ſhall not be choſen into offices againſt their will.

Attorney *of the Duchy of Lancaſter* is the ſecond officer in that court, and ſeems to be there, for his ſkill in the law, placed as aſſeſſor to the chancellor of the court.

Attorney-General is a great officer under the king, created by letters patent, whoſe office is to exhibit informations, and proſecute for the crown in criminal cauſes; and to file the bills in the exchequer, for any thing concerning the king in inheritance or profits. To him come warrants for making of grants, pardons, &c. His ſalary from the crown is 1000l. per ann.

ATTORNMENT, in law, implies a transfer made from one lord to another, of the homage and ſervice a tenant makes; or that acknowledgment of duty to a new lord.

ATTRACTION, in natural philoſophy, an indefinite term applicable to all actions whereby bodies tend towards one another, by ſome latent power. The different kinds of attractions are commonly divided into four, viz. of Coheſion, of Electricity, of Gravity, and Magnetiſm.

Attraction *of Coheſion* is that by which minute bodies, or the ſeveral particles of the ſame body when placed aſunder, or at very ſmall diſtances, mutually approach each other, and then adhere or ſtick together, as if they were but one body. This attraction is ſtrongeſt when the parts of the bodies touch one another, but decreaſes much faſter than the attraction of gravity, when the parts that were before in contact ceaſe to touch; and when they become to be at any ſenſible diſtance, this attraction of coheſion becomes almoſt inſenſible.

The attraction of coheſion may be proved by a great number of experiments, of which ſome of the moſt obvious are as follows: Firſt, Suppoſe a capillary tube, open at both ends, be put into a veſſel of water, the water will immediately riſe up in the tube to a certain height above the level. This riſe of the water is manifeſtly owing to the attraction of thoſe particles of the glaſs, which lie in the inner ſurface of the tube immediately above the water; for the quantity of water raiſed is always proportionable to the largeneſs of that ſurface; and the heights the water riſes to in different tubes, are obſervable to be reciprocally as the diameters of the tubes; from whence it follows, that the quantities raiſed, are as the ſurfaces which raiſe them; which may thus be demonſtrated. Let there be two tubes, the diameter of the firſt double to that of the ſecond, then will the water riſe half as high in the firſt as in the ſecond; for was it to riſe equally high in both, the quantity in the firſt would be four times as great as in the ſecond, cylinders of equal heights being as the ſquares of their diameters; therefore, ſince it is but found to riſe half as high, the quantity is but twice as much, and therefore is as the diameter; but the ſurfaces of cylinders are as their diameters, therefore the quantities of water raiſed are as the ſurfaces.

Again, let two ſpheres of quickſilver be placed near each other, and they will immediately run together, and form one globule; but theſe ſpheres will not approach each other, except they are placed very near; from whence it is plain, that this kind of attraction only acts in contact, or at very ſmall diſtances; likewiſe, by the following experiment, we may prove that it is always the ſtrongeſt, where the contact is the greateſt. Let two boards of fir, or oak, be glued in the middle along the grain, and it will be eaſier to break them aſunder in any other part, than in the glued place; becauſe there are more pores, and conſequently fewer touching parts along the wood, any where elſe than there are in the glued part; for when a joint is ſhot, or the two pieces of wood made ſmooth in order to join them, the glue which is ſpread on the pieces fills the pores, and cauſes the wood not only to touch where it did before, but even in the interſtices where it did not touch, becauſe thoſe little ſpaces are filled with glue, that ſupplies the place of wood. On the contrary, when the wood is more ſolid, or has fewer pores than the glue, it does not hold ſo faſt where it is glued, as in the other parts of the wood, which may be ſeen in Brazil-wood, ebony, or lignum-vitæ, and in metals; likewiſe the parts of glaſs which are almoſt round, touching but in few points, are eaſily ſeparated, and therefore it breaks eaſily. We may likewiſe prove by experiment, that this kind of attraction acts according to the breadth of the ſurfaces of the attracting bodies, and not according to their quantities of matter; for let there be poliſhed glaſs plates laid one upon another in ſuch a manner as to touch at one end, and there make a very ſmall angle; then if two unequal drops of oil be put between thoſe plates, at equal diſtances from the line of contact, ſo that the leaſt may touch both glaſſes, they will then both move towards the ends that touch, becauſe the attraction of the ſurfaces inclines that way; but the largeſt touching the glaſſes in moſt points, will move the faſteſt.

It is likewiſe obſerved, that this attraction of coheſion decreaſes, much more than that of the ſquares of the diſtances of the attracting bodies from each other increaſe; that is, whatever the force of attraction is, at a given diſtance; at twice that diſtance,

tance, it ſhall be more than four times leſs than before.

From the nature of the attraction of coheſion, we have a rational ſolution of ſeveral very curious and ſurpriſing phænomena; as why the parts of bodies adhere and ſtick ſo firmly together; why ſome are hard, others ſoft; ſome fixed, others fluid; ſome elaſtic, others void of elaſticity: all which ariſe from the different figures of the particles, and the greater or leſſer degree of attraction conſequent thereupon. On this principle, we account for the manner how plants imbibe the nutritive juices by the fibres of the roots; alſo for the riſe of the ſap in vegetables, and for the whole œconomy of vegetation. Hence the rationale of the various ſecretions of fluids by the glands, and their wonderful circulation through the fine capillary veſſels. Hence alſo the reaſon of ſoldering and gilding metals; alſo of melting, or fuſion, by heat. Hence alſo the exhalation of vapours by the heat of the ſun or fire; the aggregation of aqueous particles in the air, forming the drops of rain. We hence ſee the reaſon of diſtillation, filtration, diſſolution, digeſtion, ſublimation, precipitation, cryſtallization, and the other operations of chemiſtry and pharmacy. Laſtly, it is by this power of attraction and repulſion, that we are to account for thoſe wonderful phænomena of ſubterranean aſcenſions and exploſions; of volcanos and earthquakes; of hot ſprings, damps, and ſuffocating exhalations in mines, &c. See the article COHESION.

The ſecond ſpecies of attraction is that of electrical bodies, as glaſs, amber, ſealing-wax, jet, &c. for the properties of which ſee ELECTRICITY.

ATTRACTION *of Gravitation* is that by which diſtant bodies act upon each other. Of this we have daily inſtances in the falling of heavy bodies toward the earth.

The laws of this attraction are, Firſt, That it decreaſes, as the ſquares of the diſtances between the centers of the attracting bodies increaſe. Thus, a body which at the ſurface of the earth (i. e. about the diſtance of four thouſand miles from its center) weighs ten pounds, if it was placed four thouſand miles above the ſurface of the earth, i. e. twice as far diſtant from the center as before, would weigh four times leſs; if thrice as far, nine times leſs, &c. The truth of this propoſition is not to be had from experiments, (the utmoſt diſtance we can convey bodies to, from the ſurface of the earth, bearing no proportion to their diſtance from its center) but is ſufficiently clear from the motions obſerved by the heavenly bodies. Secondly, Bodies attract one another with forces proportionable to the quantities of matter they contain; for all bodies are obſerved to fall equally faſt in the exhauſted receiver, where they meet with no reſiſtance. From whence it follows, that the action of the earth upon bodies is exactly in proportion to the quantities of matter they contain; for was it to act as ſtrongly upon a leſs body as upon a larger, the leaſt body, being moſt eaſily put into motion, would move the faſteſt. Accordingly, it is obſervable, that the weight of a body is the ſame, whether it be whole, or ground to powder.

From hence it follows, that, was a body to deſcend from the ſurface toward the center of the earth, it would continually become lighter and lighter, the parts above attracting it, as well as thoſe below; in which caſe it is demonſtrated by mathematicians, that the gravity would decreaſe with the diſtance of the body from the center.

Thus, Let there be a body as P, (Plate XVI. *fig.* 1.) placed any where within a concave ſphere, as AB, which let us ſuppoſe divided into an infinite number of thin concentric ſurfaces; we ſay, the body P will be attracted equally each way by any one of theſe, *v. g.* the interior HIKLM. Let there be lines, as IL, HK, &c. drawn through any point of the body P, in ſuch a manner as to form the ſurface of two ſimilar figures, ſuppoſe cones, the diameters of whoſe baſes may be IH, KL, which let be infinitely ſmall. Theſe baſes (being as the ſquares of the lines IH, KL) will be directly, as the ſquares of their diſtances from P (for the triangles IPH, KPI, being infinitely ſmall, are ſimilar.) But thoſe baſes include all the particles of matter in the interior ſurface, that are oppoſite to each other; the oppoſite attractions are therefore in the ſame ratio with thoſe baſes, that is, as the ſquares of the diſtances PK, PI. But the attraction is inverſely, as the ſquares of the diſtances of the attracting bodies, *i. e.* inverſely as the ſquares of the ſame diſtances PK, PI; theſe two ratios therefore deſtroying each other, it is evident, that if the concavity of the ſphere was filled with matter, that alone, which lies nearer the center than the body, can effect it, the reſpective actions of all the parts, that are more diſtant, being equal, and in contrary directions, ſince the ſame is demonſtrable of any of the remaining concentric ſurfaces. Let us ſee then what effect that, which lies nearer the center than the body, will have upon it, which may be conſidered as a ſphere, on whoſe ſurface the body is placed. The diſtances of each particle of matter from the body, (taken collectively) will be as the diameter of the ſphere, or as the radius, *i. e.* as the diſtance of the body from the center: their action therefore upon the body will be inverſely as the ſquare of that diſtance: but the quantity of matter will be as the cube of that diſtance; the attraction therefore will be alſo in that proportion. Now, theſe two ratios being compounded, the attraction

traction will be only as the distance of the body from the center.

It may be proper to observe here, that when philosophers speak of beings gravitating to, or attracting each other, that body is said to gravitate to another, which moves towards it, while the other actually is, or appears to be, at rest, and this other is said to attract the former; though, indeed, the force being mutual and equal on both sides, the same term might be applied to either the gravitating or attracting body.

It is farther to be observed, that when we use the terms attraction or gravitation, we do not thereby determine the physical cause of it, as if it proceeded from some supposed occult quality in bodies; but only use those terms to signify an effect, the cause of which lies out of the reach of our philosophy. Thus, we may say, that the earth attracts heavy bodies; or that such bodies tend or gravitate to the earth; although at the same time we are wholly ignorant, whether this is effected by some power actually existing in the earth, or in the bodies, or external to both; since it is impossible any error in our reasonings can follow from hence; it being evident, that all the consequences of such tendency must be the same, let the cause be where or what it will.

All philosophers agree that there is a certain force by which the primary planets tend towards the sun, and the secondary planets towards their primary. As we ought carefully to avoid multiplying principles, and impulse is the most known and least controverted principle of the motion of bodies, it is clear, a philosopher would naturally attribute this impelling power to a fluid. To this notion, the vortices of Des Cartes owe their birth, and this opinion seemed more plausible, because it accounted for the motions of the planets by the circular motion of the matter of the vortices, and their tendency towards the sun by the centrifugal force of the same matter: but an hypothesis is not to be admitted, which accounts only for general phænomena; particular phænomena are the tests of an hypothesis, and the failure of the Cartesian system in those overturned it. The doctrine of vortices is therefore justly exploded, as so many difficulties attend it which never can be surmounted; for, if the planets move by virtue of the action of a fluid, this fluid must have contrary properties, it must impel in one intention, and in another make no resistance, an apparent absurdity; and the remedy is worse than the disease; for the force by which the planets tend towards the sun, must, on this hypothesis, be ascribed to an occult quality, which is saying nothing at all: and Aristotle, who perhaps invented the term, is much more pardonable than many modern philosophers who have blindly followed him.

We may therefore truly assert, that attraction is a primordial quality of matter; nor is it perhaps possible to explain the celestial bodies on the principle of impulsion. Sir Isaac Newton seems to waver in some parts of his works concerning the nature of attraction, and admits of an impelling power; there is reason to think it was a kind of tribute he chose to pay to the prejudice, or rather the general opinion of the age he lived in, than his real sentiment; because he admitted Mr. Cotes, his disciple, to adopt attraction without reserve, as may be seen in the preface to his second edition of his Principia; and this preface was written under the eye of Sir Isaac, and had his approbation. Besides, Sir Isaac admits a reciprocal attraction among the celestial bodies, and this very opinion seems to suppose attraction a quality inherent in bodies; but be that as it may, according to Newton, the attractive force decreases in an inverse ratio to the squares of the distances: this learned philosopher has solved a great part of the celestial phænomena on this single principle, and all who have tried to account for them since, on the same principle, have succeeded to a surprizing degree of exactness. The motion of the moon's apogee, which was pretended to be irreconcileable to this hypothesis, is now found to be entirely conformable to it, and does honour to the Newtonian system. All the other inequalities of the motion of the moon, which are very considerable, may also easily be accounted for by the system of attraction, and demonstrated by calculation.

All the phænomena hitherto observed, demonstrate a mutual tendency of the planets towards each other; wherefore, we must admit this for a truth on its own evidence: and though we should be forced to acknowledge this a primordial and inherent quality in matter, we may venture to say, that the difficulty of conceiving such a cause would be a very weak argument against its existence. No one doubts but that a body which meets another communicates motion to it; but have we an idea of the power by which this communication is made? The vulgar eye here, perhaps, penetrates as far as that of the philosopher. No body is surprized at seeing a stone fall; they have always seen it; philosophers, well acquainted with the effects of impulsion, have never troubled themselves about the cause which produces them. Now, if every body which meets another should stop without communicating motion to it, a philosopher would be as much astonished at this phænomenon, as a common man at seeing a heavy body suspended in the air. If we understood wherein the impenetrability of matter consists, we should not perhaps be clearer about the nature of the impelling power. We only see that, in consequence of this impenetrability, the shock of one body against another must be followed by some change, either in both or one of the bodies; but we know not, and perhaps never shall, by what power this change is effected; and why,

why, for inſtance, a body which ſtrikes againſt another ſhould not always continue at reſt after the ſhock, without communicating a part of its motion to the body which reſiſts it. It is apprehended attraction contradicts the notion we have of matter; but, if we enquire attentively, we ſhall find theſe ideas no way repugnant. The univerſe is concealed from us by a curtain, we ſee only ſome part of it; were that drawn up on a ſudden, we ſhould be ſurprized to ſee what paſſes behind it: beſides, the pretended inconſiſtence of attraction with the nature of matter, is ſolved by admitting an intelligent Being, who could as eaſily ordain bodies to act on each other at a diſtance as in contact.

M. de Maupertuis, in his diſcourſe on the figures of the planets, has given an idea of the ſyſtem of attraction, with remarks on it: and the ſame author obſerves, in the Mem. Acad. 1734, that, long before Sir Iſaac Newton, Roberval de Fermat and Paſcal thought gravity an attractive power, and inherent in bodies. We will add, that Hook had the ſame notion, and foretold that all the motions of the planets would one day be accounted for on this ſingle principle. Theſe reflections, by increaſing the number of great men who were of the ſame opinion with Sir Iſaac, take nothing from his glory; for, as he was the firſt who actually demonſtrated this principle, he is properly the author of it.

ATTRACTION *of Mountains.* If it be admitted that all parts of the earth attract each other mutually, it muſt be granted that there are mountains on it, whoſe magnitude is conſiderable enough to make a ſenſible attraction. Let us ſuppoſe the earth a globe of an uniform figure, whoſe radius is equal to 1500 leagues, and ſuppoſe a mountain on the ſurface of ſome part of this globe one league in height, it is eaſy to demonſtrate, that a weight placed at the bottom of this mountain ſhall be attracted horizontally by the mountain, with a force equal to a 3000th part of the weight; ſo that a pendulum or plumb line, placed at the bottom of this mountain, muſt deviate from a perpendicular about a minute; the calculation is not difficult, and this may be admitted by way of ſuppoſition: from whence it follows, that when we obſerve the elevation of a ſtar at the foot of a great mountain, the plumb-line muſt deviate from a perpendicular; and an obſervation of this kind, certainly would afford a very ſtrong proof in favour of the ſyſtem of attraction: but it may be objected, how ſhall we be ſure the plumb-line actually deviates from a perpendicular, as the direction of the plumb-line only determines the vertical ſituation of the ſtar? This difficulty is eaſily ſurmounted.

Let us ſuppoſe a ſtar on the north of the mountain, and the perſon who is to make his obſervation placed on the ſouth: if the attraction of the mountain acts ſenſibly on the plumb-line, it will deviate from a perpendicular towards the north; and, conſequently, the apparent zenith of the ſtar will go back towards the ſouth; and ſo the diſtance of the ſtar, on which the obſervation is made in the zenith, muſt be greater than if there was no attraction.

After having made this obſervation, if we go at a diſtance from the mountain, or a right line towards the eaſt or weſt, ſo far that the attraction no longer operates, an obſervation made in this new ſtation will ſhew the ſtar at leſs diſtance than in the former.

But there is another and better method. It is certain, that, if the plumb-line on the ſouth ſide of the mountain deviates towards the north, the plumb-line in the north ſide muſt deviate towards the ſouth, and the zenith of the ſtar, which in the firſt caſe went back towards the north, muſt, in the latter, advance towards the ſouth: therefore, taking the difference of theſe two diſtances, and dividing it into two equal parts, will ſhew how much the pendulum has deviated from a perpendicular by the attraction of the mountain.

The whole theory is clearly explained, with ſeveral remarks, in an excellent Memoir of M. Bouguer's, printed in the year 1749, at the end of his book on the figure of the earth: in which he gives an account of the obſervations he made in company with M. Condamine, on the north and ſouth ſides of the great mountain Chimboraco, in Peru; the reſult of his obſervations is, that the attraction of this great mountain cauſes a deviation of the plumb-line from its perpendicular of 7″ and a half. Mr. Bouguer judiciouſly remarks, that the greateſt mountain is a trifle compared to the vaſt body of the terreſtrial globe; and that a hundred obſervations where no ſenſible attraction is found, prove nothing againſt the Newtonian ſyſtem; but that this made at the foot of the vaſt mountain Chimboraco, which is in favour of the doctrine of attraction, deſerves the attention of all philoſophers.

For the properties of the fourth kind of attraction, ſee MAGNETISM.

ATTRACTIVE, ſomething that has the power or property of attaction.

ATTRACTIVES, or ATTRACTIVE *Medicines*, a name given by ſome writers to what are otherwiſe called *digeſtives*, *drawers*, *&c.*

ATTRIBUTE, in a general ſenſe, means a quality or property that is inherent in ſome perſon or thing.

We may diſtinguiſh attributes into *proper* and *common*: when an attribute is founded on all the eſſential qualities of any being, it may be called *proper*; when it belongs only to ſome one or more of them, it is *common*. To illuſtrate this by an example: the equality of the three angles of every rectilineal triangle to two right ones, is a *proper attribute*,

tribute, because this equality is determined both by the number of the sides, and the particular kind of lines, that are essential properties of this triangle: but the number of angles in a triangle is only determined by the sides of the triangle; and therefore this is a *common attribute*, that happens in general to all figures of this kind, whether they are rectilineal triangles or curvilineal.

Of the several attributes of any subject, that which presents itself first, and which the mind conceives as the foundation of all the rest, is called its essential attribute. Thus extension is by some, and solidity by others, made the essential attribute of body or matter. The other attributes are called *accidental* ones, such as *figure*, *malleability*, &c.

ATTRIBUTES, in theology, are qualities or perfections in the Deity, which constitute his essence: such, for instance, are infinity, eternity, mercy, goodness, justice, omnipotence, immutability, &c.

The heathen mythology divided the Deity into as many distinct beings as he had attributes: hence arose that vast plurality of gods which over-ran the heathen world. The power of God was called Jupiter, his vengeance Mars, his wisdom Apollo, &c. These, however, were rather vulgar notions, adapted to the mean understandings of the populace, than believed by their philosophers; the wisest of whom thought that the one Supreme possessed all these qualities in their highest perfection, and yet remained at the same time uniform, simple, and harmonious.

ATTRIBUTES, in logic, are the predicates of any subject, or what may be affirmed or denied of any thing.

ATTRIBUTES, in painting and sculpture, signify the symbols added to several figures to intimate their particular office and character. Thus the eagle is the attribute of Jupiter; a peacock of Juno; a caduce of Mercury; a club of Hercules; a trumpet of Fame; a balance of Justice; and a palm of Victory.

ATTRITION, in a general sense, implies the rubbing or striking of bodies one against another, so as to throw off some of their superficial particles.

The word is Latin, *attritio*, and derived from *attero*, to rub against.

The grinding or polishing of bodies is performed by attrition, the effects of which are heat, light, fire, and electricity.

ATTRITION is often used for the friction of such simple bodies as do not wear from rubbing against one another; but whose fluids are, by that motion, subjected to some particular determination; as the various sensations of hunger, pain, and pleasure, are said to be occasioned by the attrition of the organs formed for such impressions.

ATTRITION, among divines, signifies a sorrow or repentance for having offended God, arising chiefly from the apprehensions of punishment, the loss of heaven, and the torments of hell; and differs from contrition, inasmuch as this last is conceived to arise from a love to God, as an ingredient or chief motive to our sorrow and repentance. See the article CONTRITION.

AVANT *Fosse*, in fortification, is a moat or ditch full of water, running round the counterscarp, on the outside next the country, at the foot of the glacis. It is not proper to have such a water ditch where it can be drained dry, because it is a trench ready made for the besiegers to defend themselves against the sallies of the besieged; besides, it hinders putting succours into the place, or at least makes it difficult so to do.

AVAST, amongst seamen, stop, hold.

AVAUNCHERS, among hunters, the second branches of a deer's horn.

AUBIN, in horsemanship, a kind of broken pace, between an amble and a gallop. It is reckoned a defect.

AUCTION, *Auctio*, a kind of public sale, very much in use for houshold goods, books, plate, &c. By this method of sale, the highest bidder is always the buyer.

This was originally a kind of sale among the antient Romans, performed by the public crier, *sub hasta*, i. e. under a spear, stuck up upon that occasion by some magistrate, who made good the sale by delivery of the goods.

AUDIANISM, the same with anthropomorphism, or the doctrine of the anthropomorphites. See the article ANTHROPOMORPHITES.

AUDIENCE, in a general sense; see the article HEARING.

AUDIENCE given to ambassadors, implies the ceremonies observed in courts, at the admission of ambassadors, or public ministers, to a hearing.

In England, audience is given to ambassadors in the presence-chamber; to envoys and residents, in a gallery, closet, or in any place where the king happens to be. Upon being admitted, as is the custom of all courts, they make three bows, after which they cover and sit down; but not before the king is covered and sat down, and given them the sign to put on their hats.

When the king does not care to have them covered, and sit, he himself stands uncovered; which is taken as a slight.

At Constantinople ministers usually have audience of the grand vizier.

AUDIENCE is also the name of a court of justice established in the West-Indies by the Spaniards, answering in effect to the parliament in France.

These courts take in several provinces, called also audiences, from the names of the tribunal to which they belong.

AUDIENCE is also the name of an ecclesiastical court held by the archbishop of Canterbury, wherein

in differences upon elections, conſecrations, inſtitutions, marriages, &c. are heard.

AUDIENDO & TERMINANDO, a writ, or more properly a commiſſion, directed to certain perſons, when any riotous aſſembly, inſurrection, &c. is committed in any place, for appeaſing it, and puniſhing the offenders.

AUDIENTS, an order of catechumens, in the primitive Chriſtian church, conſiſting of ſuch as were but newly inſtructed in the myſteries of the Chriſtian religion, and not yet admitted to baptiſm.

AUDIT, a regular hearing and examination of an account by ſome proper officers appointed for that purpoſe.

AUDITA QUERELA, a writ that lies uſually where one is bound in a ſtatute merchant, ſtatute ſtaple, or recognizance, when a perſon has any thing to plead, but hath not a day in a court for pleading it; or where judgment is given for debt, and the defendant's body in execution; then, if he have a releaſe, or other ſufficient cauſe to be diſcharged therefrom, but wants a day in court to plead the ſame, this writ may be granted him againſt the perſon that has recovered, or againſt his executors.

This writ is granted by the lord chancellor, upon view of the exception ſuggeſted to the judges of either bench, willing them to grant ſummons to the ſheriffs of the county where the creditor is, for his appearance, at a certain day, before them.

AUDITOR, in a general ſenſe, a hearer, or one who liſtens and attends to any thing.

AUDITOR is alſo uſed for ſeveral officers appointed to audit. See AUDIT.

It was antiently uſed for a judge. Notaries are alſo frequently called auditores.

AUDITOR, according to our law, is an officer of the king, or ſome other great perſon, who, by examining yearly the accounts of the under-officers, makes up a general book, with the difference between their receipts and charges, and their allowances or allocations.

AUDITOR *of the Receipts* is an officer of the exchequer, who files the tellers bills, makes an entry of them, and gives the lord-treaſurer a certificate of the money received the week before. He alſo makes debentures to every teller before they receive any money, and takes their accounts. He keeps the black-book of receipts, and the treaſurer's key of the treaſury, and ſees every teller's money locked up in the new treaſury.

AUDITORS *of the Revenue*, or *of the Exchequer*, officers who take the accounts of thoſe who collect the revenues and taxes raiſed by parliament, and take the accounts of the ſheriffs, eſcheators, collectors, tenants, and cuſtomers, and ſet them down in a book and perfect them.

AUDITORS *of the preſt and impreſt*, are officers of the exchequer, who take and make up the account of Ireland, Berwick, and the Mint, and of any money impreſſed to any man for the king's ſervice.

AUDITORS *Collegiate, Conventual, &c.* officers formerly appointed in colleges, &c. to examine and paſs their accounts.

AUDITORY, ſomething relating to the ſenſe of hearing. See the article HEARING.

AUDITORY, or AUDIENCE, an aſſembly of people who attend to hear a perſon that ſpeaks in public.

AUDITORY is alſo uſed for the bench whereon a magiſtrate or judge hears cauſes.

AUDITORY was alſo the place in ancient churches where the congregation ſtood to hear ſermons.

Meatus AUDITORIUS, auditory paſſage, in anatomy; ſee MEATUS *Auditorius*.

AUDITORY *Nerves*, in anatomy, a pair of nerves ariſing from the medulla oblongata, with two trunks, the one of which is called the portio dura, or hard portion, the other portio mollis, or ſoft portion. See the article NERVE.

The portio mollis enters the foramen of the os petroſum, and thence through various little apertures, gets into the labyrinth of the ear, where it expands over all its parts, and conſtitutes the primary organ of hearing.

The portio dura, paſſing the aquæduct of Fallopius, turns back one or more branches from the anterior ſurface of the proceſs of the petroſum, into the cavity of the cranium. It ſends off alſo another branch internally, which with the branch from the fifth pair, ſerves for the conſtruction of the chorda tympani. It alſo ſends off a number of other ſmall ramifications, which run to the muſcles and other parts of the tympanum.

AVE-MARIA, the angel Gabriel's ſalutation of the Virgin Mary, when he brought her the tidings of the incarnation.

It is become a prayer, or form of devotion, in the Romiſh church. Their chaplets and roſaries are divided into ſo many ave-maries, and ſo many pater-noſters, to which the papiſts aſcribe a wonderful efficacy.

Dr. Bingham obſerves, that among all the ſhort prayers uſed by the primitive Chriſtians before their ſermons, there is not the leaſt mention of an ave-maria.

AVENA, the OAT, in botany; ſee the article OAT.

AVENACEOUS, in botany, ſomething belonging to, or partaking of the nature of the oat.

AVENOR, an officer belonging to the king's ſtables, who provides oats for the horſes. He acts by warrant from the maſter of the horſe. See the article MASTER *of the Horſe*.

AVENUE, in gardening, is a broad walk leading to an houſe, wood, &c. planted on each ſide with trees, and generally terminated with ſome diſtant object.

Avenues were formerly more in requeſt than at preſent, for of late they are with good reaſon diſuſed, as nothing can be more abſurd than to have the ſight contracted by two or more lines of trees, which ſhut out the view from all parts, except between the lines. The uſual width formerly allowed to theſe avenues was equal to the breadth of the houſe, but if planted twelve or fourteen feet wider, the trees will not only grow better, but alſo enlarge the view; as to the diſtance from each other in the row, they ſhould not be planted nearer than thirty-fiveor forty, eſpecially if the trees are of the ſpreading kind. As to the trees which are proper for planting avenues, viz. the Engliſh elm, the lime-tree, the horſe-cheſnut, the common cheſnut, the beach, and the poplar; the Engliſh elm will do in moſt grounds, except ſuch as are very moiſt and ſhallow; therefore, it is preferable to all other trees, becauſe it will bear cutting, heading, or lopping in any manner, better than moſt others; a ſpecimen of the growth and beauty of elm-trees, planted in avenues, may be ſeen in Greenwich-park: the lime-tree is valuable for its regular growth and fine ſhade, therefore not improper for this purpoſe: the horſe and eatable cheſnut alſo makes a grand appearance, as may be ſeen in the aforeſaid park, and other places: the beech is a beautiful tree, but is apt to miſcarry by tranſplanting: laſtly, the poplar, or abele, is fit for any ſoil, and is a quick grower; it ſucceeds very well in wet ſoils, in which others are apt to fail.

The old method of planting avenues being much exploded, we have at preſent a much grander way by planting the trees in clumps, or platoons, making the opening much wider than before, and placing the clumps of trees at about three hundred feet diſtant from each other; in one of theſe clumps, there ſhould be planted ſeven or nine trees, at about thirty feet aſunder; but this is only to be practiſed, where the avenue is of a conſiderable length. The avenues made by clumps are fitteſt of all for parks, as they not only appear very beautiful, but when grown up afford a good ſhade for the deer in hot weather; but when young, a trench ſhould be made round them, to prevent the deer coming to the trees to bark them.

AVENUE, in fortification, an opening or inlet into a fort, baſtion, or the like. See the article BASTION.

AVERAGE, in law, an ancient ſervice which the tenant owed to his lord by horſe or carriage.

AVERAGE, in commerce, ſignifies the accidents and misfortunes which happen to ſhips and their cargoes, from the time of their loading and ſailing, to their return and unloading; and it is divided into three kinds. 1. The ſimple or particular average, which conſiſts in the extraordinary expences incurred for the ſhip alone, or for the merchandizes alone. Such is the loſs of anchors, maſts, and rigging, occaſioned by the common accidents at ſea; the damages which happen to merchandizes by ſtorm, prize, ſhipwreck, wet or rotting; all which muſt be borne and paid by the thing which ſuffered the damage. 2. The large and common average, being thoſe expences incurred, and damages ſuſtained for the common good and ſecurity both of the merchandizes and veſſels, conſequently to be borne by the ſhip and cargo, and to be regulated upon the whole. Of this number are the goods or money given for the ranſom of the ſhip and cargo, things thrown overboard for the ſafety of the ſhip, the expences of unlading for entering into a river or harbour, and the proviſions and hire of the ſailors, when the ſhip is put under an embargo. 3. The ſmall averages, which are the expences for towing and piloting the ſhip out, or into harbours, creeks, or rivers, one third of which muſt be charged to the ſhip, and two thirds to the cargo.

Average is more particularly uſed for a certain contribution, that merchants make proportionably towards their loſſes. It alſo ſignifies a ſmall duty which thoſe merchants, who ſend goods in another man's ſhip, pay to the maſter for his care of them over and above the freight. Hence it is expreſſed in the bills of lading, paying ſo much freight for the ſaid goods with primage and average accuſtomed.

AVERAGE, in agriculture, a term uſed by the farmers in many parts of England, for the breaking of corn-fields, eddiſh, or roughings.

The word in the firſt or law ſenſe is derived from *averium*, a labouring beaſt: in the ſecond, or mercantile ſenſe, from *averia*, goods, or chattels; from the French, *avoir*, to have or poſſeſs. In the laſt, or the farmer's ſenſe, it may be derived from *haver*, an Engliſh name for oats.

AVER-CORN, that conveyed to the lord's granaries by his tenants.

AVERDUPOIS, or AVERDUPOISE *Weight*, a weight much uſed in England, and whoſe pound conſiſts of ſixteen ounces. See the article WEIGHT.

AVERIA, a general name for cattle of any kind; but, in law, is confined to oxen and horſes of the plough.

AVER-LAND, that ploughed by the tenants for the uſe of their lord.

AVERMENT, an offer of the defendant to make good an exemption pleaded in abatement, or bar of the plaintiff's action.

General AVERMENT is the concluſion of every plea to the writ, or in bar of replications, or other pleadings, containing affirmative matter.

Particular AVERMENT is when the life of a tenant for life, or a tenant in tail, is averted.

AVERNI, among the ancient naturaliſts, implied certain lakes, grottoes, and other places, which infect with poiſonous ſteams or vapours.

AVER-PENNY, money paid inſtead of average.

AVERRHOA, in botany, a genus of plants, whoſe flower conſiſts of five lanceolated petals, and ten filaments, with roundiſh antheræ; the fruit is an apple of a turbinated and obtuſe pentagonal figure, containing five cells, in which are diſpoſed angular ſeeds, ſeparated by membranes.

AVERRHOISTS, a ſect of Peripatetic philoſophers, who appeared in Italy ſome time before the reſtoration of learning, and attacked the immortality of the ſoul.

They took their denomination from Averrhoes, a celebrated interpreter of Ariſtotle, born at Cordova in Spain, in the 12th century, from whom they borrowed their diſtinguiſhing doctrine. The founder of this ſect, Averrhoes, is ſometimes called the Commentator, by way of eminence, as being ſuppoſed to have entered beſt of all the commentators into the ſentiments of that philoſopher; inſomuch that ſome have pretended the ſoul of Ariſtotle had migrated into the body of Averrhoes.

The Averrhoiſts, who held the ſoul was mortal, according to reaſon or philoſophy, yet pretended to ſubmit to the Chriſtian theology, which declares it immortal. But the diſtinction was held ſuſpicious; and this divorce of faith from reaſon was rejected by the doctors of that time, and condemned by the laſt council of the Lateran, under Leo X. yet it was ſtill ſecretly maintained. Pomponatius, Cæſalpinus, and others, were ſuſpected of favouriug this opinion: but the corpuſcular philoſophy, now introduced into Italy, ſeems almoſt to have extinguiſhed Averrhoiſm.

AVERRUNCATION, in the ancient agriculture, ſignified the ſame with pruning. See the article PRUNING.

AVERRUNCI, in the ancient mythology, an order of deities, whoſe peculiar office it was to avert misfortunes. Apollo and Hercules were of this order among the Greeks, and Caſtor and Pollux among the Latins.

The word is Latin, and compounded of *a*, from, or away, and the obſolete verb, *verruncо*, to turn.

AVERTI, in the manege, implies ſuch a pace in a horſe as is regulated and required in the leſſons.

AUGES, in aſtronomy, the ſame with apſides. See APSIS.

AUGMENT, *Augmentum*, in grammar, an accident of certain tenſes of Greek verbs, being either the prefixing a ſyllable, or the increaſe of the quantity of the initial vowels.

There are two ſpecies of augments, diſtinguiſhed by the epithets *temporale* and *ſyllabicum*. The *augmentum temporale* is when a ſhort vowel is changed into a long one, or a diphthong into another of greater length: an *augmentum ſyllabicum* is when a ſyllable is added at the beginning of a word.

AUGMENTS, in mathematics, the ſame with increments. See FLUXIONS and INCREMENTS.

AUGMENTATION, in a general ſenſe, implies the act of adding or joining ſomething to another, in order to increaſe its magnitude, or render it more conſiderable.

The word is Latin, *augmentatio*, and derived from *augeo*, to increaſe.

Court of AUGMENTATION, a court erected in the 27th year of Henry VIII. to take care that the revenues of the crown were properly augmented by the eſtates ariſing from the ſuppreſſion of religious houſes. This court was diſſolved in the firſt year of the reign of queen Mary; but the office, in which are many valuable records, ſtill remains.

AUGMENTATION, in heraldry, are additional charges to a coat armour, frequently given as particular marks of honour, and generally borne either on the eſcutcheon or a conton. Thus all the baronets of England bear the arms of Ulſter in Ireland.

AUGRE, or AWGRE, an inſtrument uſed by carpenters, millwrights, &c. for boring large round holes. It conſiſts of a wooden handle and an iron blade, terminated with a ſteel bit.

AUGURS, among the old Greeks and Romans, were officers appointed to foretel future events by the chattering and feeding of birds, &c. There was a college, or community of them, conſiſting originally of three members, with reſpect to the three tribes, the Luceres, Rhamnenſes, and Tatienſes: afterwards the number was increaſed to nine, four of them patricians, and five plebeians: this was in the conſulſhip of M. Valerius, and Q. Apuleius. They bore an augural ſtaff, or wand, as the enſign of their authority. Cicero was of the college of Augurs.

AUGURY, in its firſt and proper ſenſe, the art of foretelling future events by the chattering, ſinging, and feeding of birds; but in its more general ſignification, compriſing all the different kinds of divination; which Varro diſtinguiſhes into four ſorts, according to the four elements; viz. Pyromancy, or augury by fire; Aeromancy, or augury by air; Hydromancy, or augury by water; and Geomancy, or augury by the earth. It was a very ancient ſuperſtition; for we find it forbidden by Moſes. It was in great eſteem among the Chaldæans, from whom the Greeks learned it; and from them the Tuſcans had ſo high a value for this art, that, by a decree of the ſenate, it was ordered, that the advice of the augurs ſhould be held ſacred, and never deviated from. But what

opinion the wiſer Romans had of the art, appears from the ſaying of Cato, recorded by Cicero, That he wondered how two augurs could meet, without laughing in each other's face.

The place from whence auguries were taken, was a riſing ground; and Servius, on Virgil, obſerves, that there was a field ſet apart for it, at a little diſtance from Rome. When all things were diſpoſed for taking an augury, the augur entered into his tent or pavilion, habited in his robe, and holding his augural ſtaff in his hand; with which he divided the heavens into four parts, drawing a line from eaſt to weſt, and another croſs it from north to ſouth: then he ſacrificed to the gods, and offered up a prayer; after which he returned to his ſeat, and obſerved with great attention from what part, and in what manner, the ſign from heaven appeared. If, for inſtance, there happened lightning, or a clap of thunder, from the left, it was taken for a favourable preſage.

But the principal kind of augury, and from which it has its name, was the obſervation of birds; to which the ancients were ſo ſuperſtitiouſly addicted, that they never would undertake any thing of the leaſt importance, without conſulting theſe feathered oracles. The invention of this art is by ſome aſcribed to Prometheus; by others to Orpheus.

The Romans, whenever they went to war, not only conſulted the chattering and flight of birds, but their manner of feeding likewiſe; for which purpoſe they kept poultry, which they commonly fetched from the iſland of Eubœa. When they would take a preſage from thence, they flung corn before them: if the ſacred chickens crowded about it, and ate it greedily, it was looked upon as a favourable omen; but if they refuſed to eat or drink, it was an unlucky ſign.

AUGUST, in chronology, the eighth month of the year, according to our method of computing, beginning with January: but it was the ſixth with the Romans, who for that reaſon called it Sextilis; which name was changed to Auguſt, from Auguſtus Cæſar, becauſe this emperor, being returned from the Gauls in the 746th year of Rome, endeavoured to reform the calendar; and, in honour of him, Sextilis was changed to Auguſt. Others allege, the reaſon was, becauſe he was firſt made conſul in this month, and becauſe he gained great victories in it. The Turks have alſo taken this name from the Greek or Roman calendars, ſince they call it Agoſtos.

AUGUSTALES, in Roman antiquity, an epithet given to the flamens or prieſts appointed to ſacrifice to Auguſtus, after his deification, and alſo to the ludi or games celebrated in honour of the ſame prince, on the fourth of the ides of October.

AUGUSTALIA, a feſtival inſtituted by the Romans, in honour of Auguſtus Cæſar, on his return to Rome, after having ſettled peace in Sicily, Greece, Syria, Aſia, and Parthia; on which occaſion they likewiſe built an altar to him, inſcribed *Fortunæ reduci*.

AUGUSTALIS PRÆFECTUS, a title peculiar to a Roman magiſtrate who governed Egypt, with a power much like that of a pro-conſul in other provinces.

AUGUSTAN, in a general ſenſe, denotes ſomething relating to the emperor Auguſtus. Thus, we ſay, Auguſtan age, Auguſtan æra, &c.

AUGUSTIN MONKS, a religious order in the church of Rome, who follow the pretended rule of St. Auguſtin, preſcribed them by pope Alexander IV. in the year 1256. There had ariſen ſeveral religious orders in the thirteenth century; as the preaching brothers, founded by Dominic Guzman; the minims, by St. Francis Aſſiſius; and others. Innocent IV. formed a deſign of uniting ſeveral of theſe orders into one; which deſign was executed by his ſucceſſor Alexander IV. who made one congregation of them, under the name of Auguſtin hermits.

At preſent the order is divided into ſeveral branches; as the hermits of St. Paul; the Ieronymitans; the monks of St. Bridget; and the barefooted Auguſtins, inſtituted by a Portugueſe, in 1574, and confirmed by pope Clement VIII. in 1600. As to the rule of St. Auguſtin, which they pretend to follow, it is briefly this: The monks are to have all things in common; the rich, who enter into the order, are to ſell their poſſeſſions, and give them to the poor: nothing is to be received, without leave of the ſuperior; if it happens that the monks are obliged, through perſecution, to retire, they are to betake themſelves immediately to the place whither their ſuperior is withdrawn: they are to employ the firſt part of the morning in labouring with their hands, and the reſt in reading: they have Saturday allowed them to provide themſelves with neceſſaries, and are permitted to drink wine on Sundays. When they go abroad, they muſt always go two in a company: they are never to eat but in their monaſtery: they are forbidden to harbour the leaſt thought of women: they are to receive no letters or preſents in ſecret. Theſe, with ſeveral other precepts relating to charity, modeſty, chaſtity, and other Chriſtian virtues, conſtitute what they call the rule of St. Auguſtin, which is read in the preſence of the monks once every week. The Auguſtins are cloathed in black. At Paris, they are known under the name of the religious of St. Genevieve, that abbey being the chief of the order. There are nuns likewiſe of this order.

AUGUSTINUS, the name of Janſenius's treatiſe,

treatise, from which are collected the five famous propositions enumerated under the article Jansenism. See Jansenism.

AVIARY, a place set apart for feeding and propagating birds. It should be so large, as to give the birds some freedom of flight; and turfed, to avoid the appearance of foulness on the floor.

AVIS, the name of an order of knighthood in Portugal, instituted by Sancho the first king, in imitation of the order of Alcantara, whose green cross they wear.

AULA is used for a court baron, by Spelman; by some old ecclesiastical writers, for the nave of a church, and sometimes for a court-yard.

AULIC, an epithet given to certain officers of the empire, who compose a court, which decides, without appeal, in all processes entered in it. Thus we say, aulic council, aulic chamber, aulic counsellor.

The aulic council is composed of a president, who is a catholic; of a vice-chancellor, presented by the archbishop of Mentz; and of eighteen counsellors, nine of whom are protestants, and nine catholics. They are divided into a bench of lawyers, and always follow the emperor's court, for which reason they are called *justitium imperatoris*, the emperor's justice, and aulic council. The aulic court ceases at the death of the emperor; whereas the imperial chamber of Spire is perpetual, representing not only the deceased emperor, but the whole Germanic body, which is reputed never to die.

Aulic, in the Sorbonne and foreign universities, is an act which a young divine maintains upon being admitted a doctor in divinity.

It begins by an harangue of the chancellor, addressed to the young doctor, after which he receives the cap, and presides at the aulic, or disputation.

AULNEGER, or Alnager. See the article Alnager.

AULOS, αὐλὸς, a Grecian long-measure; the same with stadium. See Stadium.

AUMBRY, a country word denoting a cupboard. See Cupboard.

AUME, a Dutch measure for Rhenish wine, containing forty English gallons.

AUNCEL-Weight, an ancient kind of ballance, now out of use, being prohibited by several statutes, on account of the many deceits practised by it. It consisted of scales hanging on hooks, fastened at each end of a beam, which a man lifted up on his hand. In many parts of England, auncel-weight signifies meat sold by the hand, without scales.

AUNE, a long measure used in France to measure cloth, stuffs, ribbons, &c.

At Rouen it is equal to one English ell, at Calais to 1.52, at Lyons to 1.016, and at Paris to 0.95.

AVOCADO *Pear*. See Laurus.

AVOCATORIA, a mandate of the emperor of Germany, addressed to some prince, in order to stop his unlawful proceedings in any cause appealed to him.

AVOIDANCE, in the canon law, is when a benefice becomes void of an incumbent, which happens either in fact, as by the death of the parson, or in law, as by cession, deprivation, resignation, &c. In the first of these cases, the patron must take notice of the avoidance, at his peril; but in avoidance by law, the ordinary is obliged to give notice to the patron, in order to prevent a lapse.

AVOWEE, one who has a right to present to a benefice. See Advowson.

He is thus called in contradistinction to those who only have the lands to which the advowson belongs for a term of years, or by virtue of intrusion or disseisin. See the article Intrusion, &c.

AVOWRY, in law, is when a person distrained sues a replevin; for then the distrainer must avow, and justify his plea, which is called his avowry. See the article Replevin.

The avowry must contain sufficient matter for judgment to have return, but so much certainty is not required therein, as in a declaration; and if made for rent, though it appears that part of that rent is not due, yet the avowry is good for the rest.

AURA, in chemistry, a certain fine and pure spirit, found in every animal or vegetable body; but so subtile, as only to be susceptible by its smell and taste, or other effects, not found in any other but that body. This aura exhibits the proper characters of the body, by which it is accurately distinguished from all others; but is itself too fine and thin to be seen by the eyes, though armed with a microscope, or felt by the hands; and, withal, is extremely volatile; so that, when pure and single, it flies off by its great mobility, mixes with the air, and is received into the great chaos of all volatiles; and there, still retaining its same nature, it floats till it falls down in snow, hail, rain, or dew, when it again enters the bosom of the earth, impregnates it with its prolific virtue, and is at length received by other juices of the earth, and conveyed into the bodies of animals and vegetables; and, by this revolution, passes into new bodies, whose mass it animates and directs. The subtile fluid is lodged in the oil of the body, to prevent its being dissipated and thrown off; and hence it is, that all the ancient alchymists say, spirit resides in sulphur. *Boer. Chem.*

AURANTIUM, in botany, the orange. See the article Orange.

AURELIA, in natural history, the same with what

what is more usually called chrysalis, and sometimes nymph. See the articles CHRYSALIS and NYMPH.

AURELIANA, in botany, a name given by some to the panax, or alheal. See the article PANAX.

AUREOLA, in its original signification, signifies a jewel which is proposed as a reward of victory in some public dispute. Hence the Roman schoolmen applied it to denote the reward bestowed on martyrs, virgins, and doctors, on account of their works of supererogation: and painters use it to signify the crown of glory, with which they adorn the heads of saints, confessors, &c.

AUREUS, a Roman gold coin, equal in value to twenty-five denarii.

According to Ainsworth, the aureus of the higher empire weighed near five penny-weight; and in the lower empire, little more than half that weight. We learn from Suetonius, that it was customary to give aurei to the victors in the chariot-races.

AURICLE, in anatomy, that part of the ear which is prominent from the head, called by many authors auris externa. See the article EAR.

AURICLES *of the Heart*. These are a kind of appendages of the heart at its base, and are distinguished by the names of the right and left. The right auricle is much larger than the left, and this is placed in the hinder, that in the anterior part. They are intended as diverticula for the blood, during the systole. Their substance is muscular, being composed of strong fibres, and their motion is not synchronous, but achronous with that of the heart. See the article HEART.

AURICULA *Ursi*, bear's ear, in botany, a genus of pentandrious plants, classed with the primula veris, or primrose, by Dr. Linnæus; but, as they are very different both in their foliage and flowers, and are looked upon in common as distinct genuses, it may therefore be proper to treat on them separately.

The auricula plant has, of late years, been cultivated with extraordinary care and pains by the curious in gardening, being greatly esteemed, as it produces a flower of exceeding beauty, which is diversified with a greater variety of colours, and exhibits more properties to complete the idea in the fancy of a florist, than any other species of the blooming vegetable tribes. The flower consists of a bunch, or truss, of petala, by florists called pipps, supported by as many pedicles, or foot-stems, arising out of the top of the main stalk: the properties of a fine auricula may therefore be well distinguished and divided, 1st, into those that regard the pipps; 2dly, those which respect the bunch, or truss; and, 3dly, those which belong to the main stalk.

1st, Of the Pipps.

The petals, or pipps, of an auricula have four remarkable parts; viz. the disk, or outer rim, the eye, or inner rim, the tube or pipe, and the brush, or thrum, so termed in the florists language, but by botanists called filaments, and antheræ. The properties belonging to the perfection of the pipps, are,

1. The disk, or rim, to be of a lively and good colour or colours, such as may suddenly strike and captivate the sight, for this property is the foundation of all the rest; it is that which makes a flower valuable at all, or to be preferred before the grass or foliage of the plant that bears it; if the colours, therefore, make a faint or dead appearance, or are of an inelegant or ordinary tinge, or hue, such flower is not good, even though all its other properties should be the most excellent, because all the rest are not otherwise of any account, but as they assist in the more full and perfect display of this chief one of colour.

2. The colours (in all painted and brindled flowers) ought to be so equally distributed over the rim or disk, that there may be an agreeable uniformity amidst the variety; so that, upon the whole, the sight may not be offended with any disproportion, or see one side remarkably of a lighter or darker hue than another.

3. The outward edge of the rim ought to be of a circular figure, or at least so near it as that the indentures may bear but a small proportion to the breadth of the disk; for when these are deep and wide, and the points of the segments stand in the form of a star, greatly divided, the vacancies will offend the sight with an obvious deficiency and want: the case is still worse in those pipps which are subject to run out into a greater breadth on one side of the eye than on the other; this irregularity and disproportion is very disagreeable.

4. The eye (which is the annulus that environs the tube or pipe) ought to be formed like the disk, either perfectly or nearly round, and of one entire clear colour, of a strong and pure white in all painted or brindled flowers, and either the same, or of a bright yellow, or good straw colour, in whole coloured flowers.

5. The eye should be well defined from the disk, that is, it ought not to be mixed with, or shaded into, it, so as to occasion any indistinctness between the edge of one or the other.

In flowers where these two properties of the eye are imperfect, the lively contrast betwixt the rim and the eye (which otherwise reciprocally shew each other to advantge) is in a great measure destroyed. Though they may be allowed, in some measure, to be blended by the fine meal or powder which

which moſt auriculas have a ſhare of, but not ſo much as to render the edges indiſtinct.

6. The face of the whole pipp (diſk and eye) ought to be ſo well opened as to lie exactly or nearly flat, for when either it inclines inward, which is called cupping, or throws its extremity backward, both the true form of the flower and part of the colours are thrown out of ſight, and the whole truſs is greatly disfigured.

7. The tube or pipe ſhould ſtand exactly in the center of the pipp, and be truly circular, or round.

8. The tube ſhould be well filled with filaments and antheræ, in the form of a bruſh, generally called the thrum, ariſing even with the face of the pipp; for when only the ſtyle riſes like a pin, without being encompaſſed with the apices to the ſame height, the flower is called pin-eyed, and ſhews a chaſm or vacancy ſo very unpleaſant to the curious eye of a floriſt, that ſuch flowers, though they may otherwiſe have good properties, yet, failing in this central beauty, they are held but of very ſmall account.

9. The thrum ſhould be of a bright colour, and the filaments and antheræ of which it is compoſed, clear and diſtinct; for when they ſeem clotted together, or appear miſhapen, or of a dull colour, the beauty of the flower is much hurt and impaired.

10. The rim, the eye, and the pipe, ought all to bear an agreeable proportion to one another; for where any one of theſe is beheld either too large or too ſmall with reſpect to the other two, it will give the ſight of a floriſt great offence: thus if the rim is too large, the whole pipp will look heavy and clumſy, and the eye will appear narrow and mean; if the rim is too ſmall, it will look abortive, and the eye monſtrous; alſo, if the pipe is too wide, the thrum cannot fill it duly, and it will appear vacant; if the pipe is too ſmall or narrow, it will ſeem pinched, and the thrum will not have room; ſo that there will be an apparent want of due grace, air, and freedom: perhaps the beſt proportions may be obſerved where the ſemidiameter of the pipe is one, the breadth of the annulus of the eye one, and the breadth of the diſk or rim one and a half.

2d. Of the Bunch, or Truſs.

11. It is an excellent property of an auricula to be a good truſſer, that is, one which generally puts forth a great number of pipps from the main ſtalk, for by that means the beauty of the flower is greatly magnified, and makes in the whole a moſt delightful appearance.

12. The length of the pedicles which ſupport the pipps in the truſs ſhould be proportioned to the number and ſize of the pipps they ſuſtain; for if the pedicles are very long, and the pipps few and ſmall, there will be unſightly vacancies in the truſs; or if they are ſhort, and the pipps many and large, they would too much crowd together, ſo that neither the colours can be fully viewed, nor the other properties of the pipps fully diſplayed.

13. The pedicles ſhould be ſufficiently ſtrong and firm, that they may not droop with the weight of the pipps, nor fall looſe in a diſorderly manner, but ſupport the truſs entire and cloſe, without either vacancy or crowding, ſo as to appear one complete free-blown flower.

14. The pedicles ought to be near all of the ſame length, ſo that the pipps may ſtand together, at the like height, and form a regular umbel, or rather corymbus, which is the formal perfection of the truſs.

15. The pipps ſhould be all ſimilar, that is, ſo near of the ſame ſize and colour as not to be eaſily diſtinguiſhed from each other; for otherwiſe the unity and harmony of the truſs will be deſtroyed, and, though ever ſo perfectly formed, it will appear as if it were made up of pipps taken from different ſorts of auriculas.

16. It is an exceeding good property of an auricula to blow freely, and expand all its pipps nearly at the ſame time, for by this means the colours in them all will appear equally freſh and lively; whereas in thoſe which do not blow ſome of their pipps till others have paſſed their prime, the whole appearance of the truſs falls much ſhort of that beauty which would otherwiſe be ſeen.

3d. Of the main Stalk.

17. The ſtalk which ſupports the truſs ought to be ſtrait and ſufficiently ſtrong to bear it up without drooping.

18. It is an excellence of the ſtalk to be lofty as well as erect, for thereby the truſs, and conſequently the whole flower, will make a more ſtately and grand appearance.

To theſe eighteen properties, which complete the floriſts idea of a beautiful auricula, there ought to be added, the graceful diſplay of a good plant, covering the top of a flower-pot with freſh verdure or foliage of luxurious growth, and an agreeable green colour, ſuch as is expreſſive of the moſt perfect health and vigour: this vaſtly enriches the whole view of the flower and plant taken together. Moreover, though every auricula that has the above-mentioned properties cannot fail pleaſing the moſt curious and critical floriſts, yet as, upon one hand, an auricula may be ſomewhat deficient in ſeveral particulars of ſmall conſideration, and yet be juſtly eſteemed a fine and valuable flower; ſo, on the other hand, it will be a farther addition to the excellence of an auricula which has all the properties, that it naturally ſtands long in bloom, and wears its colours without fading or alteration; and alſo when the flower begins to decay (as decay it muſt, like all other terreſtrial beauties) if the colours fade equally, ſlowly, and gradually, the floriſts think it an addition to

its character, and is by them termed dying well. Auriculas are propagated either by ſowing their ſeeds, or by planting their off-ſets. In order, therefore, to obtain good flowers from ſeeds, choice muſt be made of the beſt flowers, which ſhould be expoſed to the open air, that they may have the benefit of ſhowers, which is neceſſary for their producing good ſeeds. The time of their ripening is in June, which is eaſily diſcovered by their ſeed-veſſel turning to a brown colour and opening, when they muſt be gathered before they are loſt on the ground. The time of ſowing theſe ſeeds is from Auguſt to Chriſtmas. The beſt ſoil for ſowing theſe ſeeds is in good freſh earth from a common, rather light, mixed with very rotten dung and leaves, which ſhould be previouſly prepared: with this compoſt the pots or tubs, in which the ſeeds are intended to be ſown, ſhould be filled. Having levelled the ſurface of the earth very ſmooth, ſow the ſeeds thereon, covering it very lightly with rotten willow mould, taken out of the ſtems of decayed hollow willow trees, after placing a net or wire over the earth, which will prevent the ſeed from being diſturbed by cats, fowls, &c. The boxes or tubs ſhould be ſituated where they can only receive the morning ſun. In the ſpring following the young plants will come up, when they muſt be frequently refreſhed with water in dry weather till July, when they will be large enough to tranſplant; at which time, with the aforeſaid preparation of earth, plant them in beds or boxes, about three inches aſunder, ſhading them from the ſun in hot weather. The ſpring following many of theſe plants will ſhew their flowers, when thoſe that anſwer the properties above deſcribed may be taken up and tranſplanted into pots of the ſmalleſt ſize; for if they have too large pots, they will not ſo well thrive. Thoſe flowers which are not eſteemed may be planted in the flower garden, where they will make a ſhew, and ſerve for noſegays, &c. Thoſe which do not ſhew their flowers ſhould be taken up, and planted in a freſh bed, to remain till the next ſeaſon, when their goodneſs may be judged of. The manner of propagating theſe flowers from ſlips or off-ſets, is to take them off in April, when the old plants are in bloom, and planted in ſmall pots, in the ſame ſort of earth as before directed, and, during the ſummer ſeaſon, ſhould be ſet in a ſhady place, and frequently refreſhed with water, but ſhould be protected from violent rains, which may fall in autumn, and in winter ſhould have very little wet fall on them, for nothing is more prejudicial to auriculas in winter than wet; nor muſt they be too much expoſed to the ſun in the ſpring, which is apt to forward their flowering too ſoon, when the froſts in March are too apt to damage the pipps, unleſs carefully protected. To prevent this, thoſe who are curious place their pots of auriculas under a common hot-bed frame, where, in good weather, the plants may enjoy the free air, by taking off the glaſſes, and in great rains, ſnow, or froſt, the plants may be ſcreened by covering them: where this method is practiſed with judgment, the flowers will be much ſtronger, and the plant will encreaſe faſter, than when they are expoſed abroad. In the beginning of February, if the weather is mild, the upper part of the earth in the pots ſhould be taken off as low as poſſible, ſo as not to diſturb the roots, and fill up with freſh earth: this will much contribute towards ſtrengthening the bloom, as alſo preparing the off-ſets for tranſplanting in April, by cauſing them to puſh out new roots. Thoſe plants which have ſtrong ſingle heads always produce the largeſt truſſes of flowers; therefore the off-ſets ſhould be taken off ſo ſoon as it can conveniently be done with ſafety to their growing, in order to encourage the mother plants to flower the ſtronger. The auricula pots ſhould be covered with matts in froſty weather, during the time of their budding for flower, leſt the ſharp mornings blight them, and prevent their blowing. When the flower ſtems begin to advance, and the bloſſom buds grow turgid, they muſt be protected from heavy rains, which would waſh off their white mealy farina, in which a conſiderable ſhare of their beauty conſiſts; but at the ſame time obſerve to keep them as much uncovered as poſſible, otherwiſe the ſtems will be drawn up too weak to ſupport the truſs, alſo frequent waterings ſhould be given, but not to wet the leaves. When the flowers begin to open, the pots ſhould be removed upon a ſtage built purpoſely, facing the morning ſun, and covered at top; in this poſition they will appear to much greater advantage, eſpecially when the flowers are judiciouſly contraſted; in this ſituation they may remain till their beauty is paſt, when they muſt be ſet abroad in the open air, in order to obtain good ſeeds. It may be remarked, than an auricula never thrives well, unleſs the pot is well filled with its roots; therefore the largeſt plants, as Perry's King George, when at its greateſt ſize, ſhould not have a pot larger than a thirty-two (ſo called); and others, which grow of a leſs ſize, a half-penny pot is ſufficient, into which ſized pots, according to the growth of the plant, they ſhould be ſhifted in the latter end of July, or beginning of Auguſt, taking, if poſſible, the advantage of moiſt weather.

AURICULAR, whatever belongs or relates to the ear. Thus we ſay, auricular witneſs, auricular confeſſion, &c. as being done ſecretly, and as it were in the ear.

AURICULAR *Medicines*, ſuch as are uſed in the cure of diſtempers in the ear. See the article EAR.

AURICULARIS *Digitus*, the little finger, ſo called, becauſe it is uſed commonly to pick the ear.

AURIGA, the waggoner, or carter, in aſtronomy,

my, a conſtellation of the northern hemiſphere, containing ſixty-ſix ſtars according to the Britiſh catalogue, forty by Hevelius, and twenty-three by Tycho. In this conſtellation there are two other conſtellations to be noted, whereof the one conſiſteth but of one ſtar, which is in the left ſhoulder of auriga, and is called hircus, or capra, the goat. The other conſiſteth of two little ſtars, a little beneath the other, ſtanding in the hand of auriga, this conſtellation is called hæpi, the hids.

Auriga by the Arabians is called *alaiot*, and by the Greeks, *hemochus*, that is, a man holding a bridle in his hand. Eratoſtenes affirmeth him to be Erictho-nius king of Athens, the ſon of Vulcan, who having deformed feet, firſt deviſed the uſe of the waggon or chariot, and joined horſes together to draw the ſame, ſo that ſitting therein he might the better conceal his deformity: for which invention, Jupiter tranſlated him into heaven.

The fabulous ſtory concerning the other two conſtellations is this: Saturn being told by the oracle, that one of his ſons ſhould expel him his kingdom, determined to deſtroy them all. But Ops by ſtealth conveyed away Jupiter, and ſent him to Meliſſus king of Crete, who had two daughters, Amalthea and Meliſſa, to whoſe care Jupiter was committed. Amalthea had a goat, that gave ſuck to two kids, ſo that by the milk of this goat ſhe nouriſhed Jupiter; therefore, to requite this her favour, when he came to his kingdom, he tranſlated the goat and two kids into heaven, in remembrance of his nurſe.

Novidus ſaith, that when Chriſt was born, and his birth made manifeſt by the angels unto the ſhepherds, one of them brought with him a preſent of a goat and two kids, which in token of his good-will were placed in heaven.

The right aſcenſion, diſtance from the pole, &c. to the year 1770, will be found in the following Catalogue.

Order.	Magn.	Name.	Bayer Let.	Right Aſcenſion	Diſtance from No. Pole.	Var. in Right Aſcen.	Var. in Decli nation.
				° ′ ″	° ′ ″	″	″
1	5		f	68.36.58	52.55.42	59.7	7.4
2	5		g	69.19. 3	53.42. 0	59.4	7.2
3	4		p	70.30.59	57.12.34	57.8	7.1
4	5		ω	70.54.46	52.21.51	60.2	6.9
5	6			7[illegible]. 7.25	50.57.41	60.9	6.8
6	6			71. 8.23	50.41.42	61.2	6.6
7	4		ε	71.22. 2	46.31.50	63.5	6.5
8	4	Hædr. pr.	ζ	71.36.29	49.16. 9	61.8	6.4
9	6			72.13.37	38.42.29	69.2	6.2
10	4	Hædr. ſeq.	n	72.35.19	49. 5. 6	62.3	6.0
11	5		μ	74.26.17	51.47.58	60.8	5.7
12	6			74.52.34	43.50.57	65.7	5.5

Order.	Magn.	Name.	Bayer Let.	Right Aſcenſion	Diſtance from No. Pole.	Var. in Right Aſcen.	Var. in Decli nation.
				° ′ ″	° ′ ″	″	″
13	1	Capella	α	74.51.59	44.16.36	66.3	5.28
14	5			75. 9.43	57.34.16	58.0	5.2
15	5		λ	75.43.26	50. 5.36	61.9	5.1
16	6			75.46.43	56.52.48	58.4	5.1
17	7			75.48.42	56.30.11	58.5	5.0
18	8			76. 3 49	56.16.28	58.5	4.9
19	6			76.13.38	56.17.48	58.6	4.9
20	6		ϱ	76.27.17	48.26.24	62.9	4.8
21	5		σ	77.16.29	52.50.36	62.5	4.7
22	6			77.17.58	61.17.29	66.4	4.3
23	2		γ	77.59.23	61.35.47	66.4	4.1
24	5		φ	78. 6.50	55.43.29	59.3	3.9
25	5		χ	79.26.27	57.59.42	58.1	3.6
26	6			80.58.31	59.39.52	57.3	3.1
27	6		o	82. 3.21	40.17.20	69.2	2.8
28	7			83.13.10	50.33.34	62.0	2.7
29	5		τ	83.18.58	50.54.20	61.8	2.5
30	6		ξ	83.55. 3	34.22. 3	74.6	2.4
31	6		υ	83.50.39	52.26.32	60.9	2.2
32	5		ν	83.53. 0	50.55.57	61.9	2.0
33	4		δ	85.20.14	35.44.54	73.4	1.7
34	2		β	85.36. 6	45. 5.44	66.6	1.58
35	6		π	85.43.23	44. 5.38	66.3	1.5
36	6			85.54.25	42. 7.57	67.8	1.4
37	4		θ	86. 0.11	52.49.10	60.9	1.3
38	6			86.41.16	47. 0.40	64.4	1.2
39	6			87. 8.17	47. 0.53	64.4	1.0
40	6			87.40.20	51.30.39	61.8	0.8
41	6			88.13.34	41.15.25	68.7	0.6
42	6			90. 8.33	43.31. 8	69.9	0.0
43	6			90.19. 3	43.34. 6	69.9	0.0
44	4		κ	90.10.55	63.26.57	57.3	0.1
45	6			90.47.57	36.28. 8		0.2
46	5			91.48.54	40.37. 1	69.2	0.7
47	6			93.10. 0	43.11.21	67.4	1.1
48	6			93.30.24	59.23.32	57.7	1.3
49	5			95.13.17	61.49. 6	56.6	1.4
50	5			95.42.17	47.19.16	64.3	1.6
51	5			95.41.13	50.25.29	62.4	1.9
52	5			95.40. 2	49.55.19	62.7	1.9
53	6			95.57.16	60.50.14	57.2	2.0
54	6			96.19.34	61.33.24	56.8	2.1
55	5			96.34 49	45.16.12	65.7	2.3
56	6			97.15.43	46.12.32	62.6	2.4
57	6			97.26. 7	40.59. 3	62.6	2.5
58	4			98.36.48	47.57.29	63.8	2.6
59	6			99.17. 7	50.52.11	62.2	2.8
60	6			99.20.26	51.17.21	61.8	3.0
61	6			99.32. 6	51.14.50	61.9	3.4
62	6			100.50.35	51.39.12	61.6	3.9
63	4			103 56.32	50.19.37	62.2	4.8
64	5			105.29 58	48.43.37	63.2	5.3
65	5			106.33.26	52.49.37	60.6	5.6
66	5			107. 2.47	48.54.14	62.8	5.9

AURIPIGMENTUM, ORPIMENT, in natural hiſtory. See ORPIMENT.

AURIS, the EAR, in anatomy. See EAR.

AURISCALPIUM, an inſtrument to clean the ears, and ſerving alſo for any other operation in diſorders of that part.

AURORA, the morning twilight, or that faint light which appears in the morning, when the ſun is within eighteen degrees of the horizon.

AURORA, the goddeſs of the morning, according to the pagan mythology. She was the daughter of Hyperion and Theia, according to Heſiod; but of Titan and Terra, according to others. It was under this name that the ancients deified the light, which foreruns the riſing of the ſun above our hemiſphere. The poets repreſent her as riſing out of the ocean, in a chariot, with roſy fingers dropping gentle dew. Virgil deſcribes her aſcending in a flame-coloured chariot with four horſes.

AURORA *Borealis*, the northern dawn or light; a remarkable meteor of a luminous appearance, often viſible during the night in the northern parts of the heavens.

This meteor exhibits a great variety of phænomena, of which the following are the principal.

1. In the northern part of the horizon there is commonly the appearance of a very black cloud; we ſay appearance, becauſe it is evidently no real cloud, the ſmalleſt ſtars being viſible through it. This apparent cloud is extended ſometimes farther towards the weſt than towards the eaſt; ſometimes farther towards the eaſt than towards the weſt; and generally takes up about a quarter of the horizon.

2. The upper edge of this cloud is generally terminated by a very lucid arch, from one to four or five degrees broad, whoſe center is below the horizon. Sometimes there are two or more of theſe arches, one above another. In ſome the cloud is not terminated by an arch, but by a long ſtreak of light lying parallel to the horizon. The limb of this luminous arch, or parallel ſtreak, is not always even and regular, but ſinks lower in ſome parts than in others.

3. Out of this arch proceed ſtreams of light, generally perpendicular to the horizon, but ſometimes a little inclined to it. Moſt of them ſeem to end in a point, like pyramids or cones, and often very much reſemble the tails of comets. Sometimes there is no luminous arch, nor ſtreak of light; and then the ſtreams ſeem to iſſue out from behind the dark cloud, being diſtinct from each other at their baſes.

4. The upper ends of the ſtreams inceſſantly appear and vaniſh again, as quick as if a curtain were drawn backwards and forwards before them; which ſometimes cauſes ſuch a ſeeming trembling in the air, that the upper part of the heavens were, if we may be allowed the expreſſion, in convulſions.

5. They ſometimes ſeem to meet in the zenith, or more commonly about ten degrees to the ſouthward of it, and there curling round, they, in ſome meaſure, imitate flame confined under an arch; and, being frequently tinged with various colours, exhibit a moſt beautiful appearance, reſembling a canopy finely painted, of about ten or twenty degrees in breadth.

In many auroras there are ſtreams aſcending from theſe parts of the heavens, which lie ſeveral degrees to the ſouthward of the canopy; and in ſome they appear to ariſe, though very rarely, almoſt as large and numerous from the ſouthern as from the northern parts of the horizon.

6. The height of the aurora borealis is very great; for that on the ſixth of March 1715, was viſible from the weſt ſide of Ireland, to the confines of Ruſſia and Poland to the eaſt; and perhaps much further; extending at leaſt over thirty degrees of longitude, and in latitude from about the fiftieth degree over almoſt all the north of Europe, and exhibiting, nearly at the ſame time, the ſame appearances at all places.

7. Theſe phænomena have always been very frequent in countries near the frigid zone; but very rare in our latitude. They are now however become very frequent with us, but always ſeem to proceed from the north; and are as yet unknown to the inhabitants of the more ſouthern parts of our hemiſphere. Whether they are known to thoſe who inhabit the ſouthern frigid zone, is yet undetermined.

8. In ſome there are trains of light running horizontally, ſometimes from the middle of the extremes, and ſometimes with one extreme to another: and from theſe trains ſtreams perpendicular to the horizon often ariſe, and accompany them as they paſs along.

9. When all the ſtreaming is over, the aurora borealis commonly degenerates into a bright twilight in the north, and there gradually dies away.

10. It is probable theſe phænomena often happen in cloudy nights, though we are not ſenſible of them; for it is obſervable, that in ſuch nights there is frequently more light than what uſually proceeds from the ſtars alone.

The moſt obvious ſolution of the aurora borealis, or at leaſt what would appear ſo to thoſe who have only attended to the circumſtances of ſome particular meteors of this kind, is, that it is a thin nitro-ſulphureous vapour, raiſed in our atmoſphere, conſiderably higher than the clouds; that this vapour, by fermentation, takes fire, and the exploſions of one portion of it kindling the next, the flaſhes ſucceed

ceed one another, till the whole quantity of vapour within their reach is ſet on fire.

Some have thought that vapours rarefied exceedingly by ſubterraneous fire, and tinged with ſulphureous ſteams, might thence be diſpoſed to ſhine in the night, and riſing up to the top of the atmoſphere, or even beyond its limits, might produce thoſe undulations in the air, which conſtitute this phænomenon. But theſe hypotheſes have been rejected, as inſufficient; it having been thought impoſſible to account for all the circumſtances from them.

Dr. Halley therefore thought proper to have recourſe to the magnetic effluvia of the earth, which he ſuppoſes to perform the ſame kind of circulation with regard to it, as the effluvia of any particular terrella do with reſpect to that, viz. that they enter the earth near the ſouth pole, and, pervading its pores, paſs out again at the ſame diſtance from the northern: and thinks, they may ſometimes, by the concourſe of ſeveral cauſes, very rarely coincident, and to us as yet unknown, be capable of producing a ſmall degree of light, either from the greater denſity of the matter, or perhaps from the greater velocity of its motion; after the ſame manner as we ſee electrical bodies emit light in the dark.

M. de Mairan has given us a phyſical and hiſtorical treatiſe on the aurora borealis, and endeavours to prove, that it is owing to the zodiacal light, or the atmoſphere of the ſun, ſpread on each ſide of it along the zodiac, in the form of a pyramid. This he ſays is ſometimes extended to ſuch a length as to reach beyond the orbit of our earth, and then by mixing itſelf with our atmoſphere, and being of a heterogeneous nature, produces the ſeveral appearances obſervable in the aurora borealis.

We thought proper to mention theſe ſolutions, becauſe they come from two very ingenious philoſophers; though they are certainly too fine-ſpun to hold, and ſeem no other than the ingenious reveries of perſons determined to frame an hypotheſis at any rate. We may certainly find materials for the aurora borealis, without having recourſe either to the magnetical effluvia of the earth, or the zodiacal light, the nature of both which we are wholly unacquainted with. The effluvia continually exhaled from the ſurface of the earth, if rightly conſidered, will afford a very eaſy and natural ſolution, as we ſhall now endeavour to ſhew.

Firſt, We know from experiment, that there are ſome ſteams, as inflammable ſulphureous ones, which are capable of ſo great a degree of expanſion, that they will render themſelves lighter than the air they float in, even when that fluid is as rare as it can be rendered by art; for they will riſe to the top of an exhauſted receiver: ſuch ſteams, or exhalations, therefore, iſſuing from mines, volcanos, &c. in the bowels of the earth, muſt neceſſarily aſcend towards the top of the atmoſphere, at leaſt till they come to a region where the air is as rare and as much expanded as it can be made by the air-pump here below. This height, according to Dr. Halley's computation, founded on the refraction of a ray of light, is forty-four miles and a half (ſee ATMOSPHERE): but may probably be much greater; for the air is higher than any vapours capable of refracting a ray of light can aſcend.

Secondly, Theſe effluvia being raiſed to the top of the atmoſphere, or near it, and floating there, will neceſſarily be carried towards the polar regions for the following reaſons. 1. Becauſe the ſuperior current of the air, at a great diſtance from the equator, tends that way. 2. We know from experiment that whatever ſwims upon a fluid, which revolves about an axis, is by that very motion carried towards the extremities of that axis. This is exactly the caſe of theſe effluvia; for they float near the top of the atmoſphere, which continually revolves about the axis of the earth; and muſt therefore be neceſſarily carried towards the polar regions. 3. Theſe effluvia being collected together, at or near the poles, and of an inflammable nature, may eaſily be ſuppoſed to ferment, when they meet with other heterogeneous particles proper for producing ſuch an effect, and emit fiery ſtreams, which will naturally riſe into ſuch parts of the atmoſphere as are ſtill lighter than that in which theſe corpuſcles naturally floated; that is, directly upwards from the center of the earth: but, according to the rules of perſpective, theſe ſtreams, though they really diverge as radii from a center, will appear to a ſpectator on the ſurface of the earth to converge towards a point; which point will ſeem to be directly over his head, if the ſtreams aſcend in right lines from the center of the earth; but if they deviate all one way from that direction, the point will be on that ſide the zenith towards which they incline. To illuſtrate this, let us ſuppoſe ſeveral ſtrings to hang down from the ceiling of a room, and a candle to be placed on a table below them: the ſhadows of theſe threads will all converge towards the point on the ceiling immediately over the candle: and if they are made to incline from a perpendicular direction, ſuppoſe all one way, the point of convergency will remove from the ſpot immediately over the candle, towards that ſide of the room to which the upper ends of the ſtrings incline. Now, if a perſon had viewed them from the place where the candle was ſet, and referred their places to the ceiling, they would have appeared to have converged towards the ſame point to which their ſhadows were directed by the candle.

And if the ſtreams ſpread themſelves as they riſe, but not too much, they will ſtill appear tapering towards their upper-ends, like cones or pyramids; juſt as the ſides of a long walk ſeem to a

perſon viewing it from one end, to approach each other at the fartheſt extremity.

Hence every phænomenon of the aurora borealis may be eaſily accounted for; and its height may be calculated in the following manner:

Let the ſine of the elevation of the pole be $=q$, the ſine of the greateſt altitude of the lucid arch $=m$, the ſine of half the diſtance of the legs of the arch from each other, at the horizon $=g$; the ſemi-diameter of the earth $=a$, and the ſine of the angle which is equal to the greateſt altitude of the arch, and the altitude of the equator taken together be $=b$; thus the diſtance of the matter in the vertex of the arch, from an obſerver, will be expreſſed by $\frac{2amq^2g^2}{r^3b^2-rg^2q^2}$.

AURUM, GOLD, in natural hiſtory; ſee the article GOLD.

The Latin term, *aurum*, is chiefly uſed to denote certain chemical preparations, whereof gold is the principal ingredient.

AURUM *Fulminans*, a chemical compoſition prepared by diſſolving gold in aqua regia, and precipitating the metal from the menſtruum, by adding a volatile alkali: after which the precipitated powder is edulcorated by frequent effuſions of warm water, and then dried in the ſhade.

The aurum fulminans, prepared in this manner, weighs about one fourth part more than the gold employed, three parts of gold yielding four of the fulminating powder, according to Lemery, Kunckel, and other practical writers. Part of the increaſe proceeds from the volatile alkali; for, on adding to the aurum fulminans a little vitriolic acid, the volatile ſalt riſes in ſublimation, ſatiated with the acid: the remaining powder is found to be diveſted of its fulminating power. From the coalition of the volatile alkali with the nitrous acid in the menſtruum reſults an ammoniacal nitre, a ſalt which of itſelf detonates on being heated; but by what power or mechaniſm its detonating quality is ſo remarkably increaſed in the aurum fulminans, is unknown.

The exploſion of aurum fulminans is more vehement than of any other known kind of matter: it goes off in a leſs degree of heat than any of the other exploſive compoſitions; and even grinding it ſomewhat ſmartly in a mortar, is ſufficient for making it explode. Some inſtances are mentioned in the Breſlau Collections, and the Ephemerides Naturæ Curioſorum, of a very ſmall quantity burſting in pieces the marble mortar in which it was rubbed; and an accident of the ſame kind happened ſome years ago to a ſkilful chemiſt here. The operator cannot therefore be too much on his guard in the management of ſo dangerous a preparation.

It has been reckoned, that a few grains of aurum fulminans act with as much force as ſeveral ounces of gun-powder: but the actions of the two are of ſo different kinds, that it is difficult to determine in what manner their ſtrength can be compared. The report of aurum fulminans is of extreme acuteneſs, offending the ear far more than that of a much larger quantity of gun-powder; but does not extend to ſo great a diſtance, ſeeming to differ from it as the ſound of a ſhort or tenſe muſical ſtring, from that of a long one, or of one which is leſs ſtretched. In ſome experiments made before the Royal Society, and mentioned in the firſt volume of Dr. Birch's hiſtory, aurum fulminans cloſed up in a ſtrong hollow iron ball, and heated in the fire, did not appear to explode at all; while gun-powder, treated in the ſame manner, burſt the ball. On the other hand, a little aurum fulminans, exploded on a metalline plate in the open air, makes an impreſſion or perforation in the plate; an effect which gunpowder could ſcarcely produce in any quantity.

This remarkable effect of aurum fulminans on the body, which ſerves for its ſupport, has induced ſome to believe that its action is exerted chiefly or ſolely downwards. It appears, however, to act in all directions: for a weight laid upon it, either receives a like impreſſion, or is thrown off: and, in the collection abovementioned, an account is given of a large quantity (ſome ounces) which, exploding from too great heat uſed in the drying of it, broke open the doors, and ſhattered the windows in pieces. Mr. Hellot found, that when a few grains of the powder were placed between two leaves of paper, and cemented to one of them by gum water, only the leaf which touched the powder was torn by the exploſion, and the other ſwelled out; and that when both were brought into cloſe contact with it, by preſſing them together, it tore them both; from whence he concludes, that the action of the aurum is greateſt on the bodies which it immediately touches. Both this property, and the acuteneſs of the report, may poſſibly depend upon one cauſe, the celerity of the expanſion: experiments have ſhewn, that the reſiſtance of the air, to bodies in motion, increaſes with the velocity of the body in a very high ratio; and perhaps the velocity with which aurum fulminans explodes, may be ſo great, that it is reſiſted by the air as by a ſolid maſs. *Lewis's Commercium Philoſophico-Technicum.*

AURUM *Muſivum*, or *Moſaicum*, a chemical preparation uſed by japanners in gilding their veſſels: it is made in the following manner:

Take of tin one pound, of flowers of ſulphur ſeven ounces, of ſal ammoniacum and purified quickſilver, each half a pound. Melt the tin, and add the quickſilver to it in that ſtate; and when the mixture is become cold, powder it, and grind it with the ſal ammoniacum and ſulphur, till the whole be thoroughly commixt. Calcine them in a mattraſs; and the other ingredients ſubliming, the

the tin will be converted into the aurum mosaicum, and will be found in the bottom of the glass like a mass of bright flaky gold powder: but if any black or discoloured parts appear in it, they must be carefully picked or cut out.

The sal ammoniacum employed, ought to be perfectly white and clean; and care should be taken, that the quicksilver be not such as is unadulterate with lead, which may be known by putting a small quantity in a crucible, into the fire, and observing when it is taken out, whether it be wholly sublimed away, or have left any lead behind it. The calcination may be best performed in a coated glass body, hung in the naked fire; and the body should be of a long figure, that the other ingredients may rise so as to leave the coloured tin clear of them. The quicksilver, though it be formed into cinnabar along with the sulphur, need not be wasted; but may be revived by distilling it with the addition of quick-lime.

AURUM *Potabile*, or tincture of gold, a medicine formerly of great request, but at present rarely if ever used. It is prepared by mixing essential oil of rosemary with a solution of gold in aqua-regia; and, after shaking the vessel, the gold will be retained in the oil, swimming on the top. This oil is separated by inclination, and afterwards digested for a month in highly rectified spirit of wine.

But, after all, this is not a genuine tincture of gold, being only the gold divided into very small parts by the spicula of the aqua-regia, swimming in the oil of rosemary; nor can there be any radical tincture of gold, which may not, by evaporating the oil, be reduced to a powder, and the powder by melting reduced into gold. The virtues of this tincture are entirely owing to the oil of rosemary.

AUSPICIUM. See AUGURY.

AUSTERE, rough, astringent. Thus an austere taste is such a one as constringes the mouth and tongue with some austerity; as the taste of unripe fruit.

Things of an austere taste are supposed by some, from their glutinous quality, to generate the stone.

AUSTERITY, among moral writers, implies severity and rigour. Thus we say, austerity of manners.

Austerity of bodies, according to the Cartesians, consists in having obtuse angular particles, like a blunt saw.

AUSTRAL, the same as southern; thus austral signs are the six last signs of the zodiac, being called thus, because they are of the southern side of the equinoctial.

AUTER DROIT, in law, is when persons sue, or are sued in another's right, as executors, guardians, &c.

AUTER FOIS ACQUIT, in law, a plea made by a criminal that he has been already acquitted of the same crime, with which he is charged. There are likewise pleas of auter fois convict and attaint, that he has been before convicted of the same felony.

AUTHENTIC, something of acknowledged and received authority. In law it signifies something cloathed in all its formalities, and attested by persons to whom credit has been regularly given. Thus we say, authentic papers, authentic instruments.

AUTHOR, properly signifies one who created or produced any thing. Thus God, by way of eminence, is called the author of nature, the author of the universe.

The word author is sometimes employed in the same sense as inventor. As, Otho de Guerick is reported to be the author of the air-pump.

AUTHOR, in matters of literature, a person who has composed some book or writing.

Authors may be distinguished into sacred and profane, ancient and modern, known and anonymous, Greek, Latin, English, French, &c. and with regard to the subjects they treat, into divines, philosophers, orators, historians, poets, grammarians, physiologists, &c. See the articles SACRED, PROFANE, &c.

An original author is he, who, in treating any subject, does not follow any other person, or imitate any model, either in the matter or method of his composition: for instance, M. de Fontenelle is an original author in his Plurality of Worlds, but not in his Dialogues of the Dead.

AUTHORITY, in a general sense, signifies a right to command, and make one's self obeyed. In which sense, we say, the royal authority, the episcopal authority, the authority of a father, &c.

Authority denotes also the testimony of an author, some apophthegm, or sentence of an eminent person, quoted in a discourse by way of proof.

AUTHORITY, in law, signifies a power given by word, or writing, to a second person to act something, and may be by writ, warrant, commission, letter of attorney, &c. and sometimes by law. An authority given to another, to do what a person himself cannot do is void, and it must be for doing a thing that is lawful, otherwise it will be no good authority.

AUTHORITY is represented, in painting, like a grave matron sitting in a chair of state, richly cloathed in a garment embroidered with gold, holding in her right hand a sword, and in her left a sceptre. By her side is a double trophy of books and arms.

AUTO DA FE, act of faith. The ceremony of putting in execution the several sentences pronounced

nounced on criminals by the tribunal of the inquisition. It is so called, because it is considered, in those countries where that tremendous court is settled, as the most illustrious and public proof that can be given of a zeal for religion and the Catholic faith. See INQUISITION.

AUTOCEPHALOUS, *αυτοκεφαλοι*, in church history, denotes archbishops who were independent of any patriarch.

AUTOGRAPH, *αυτογραφον*, denotes a person's hand-writing, or the original manuscript of any book, &c.

AUTOMATA are mechanical, or mathematical instruments, that, going by springs, weights, &c. seem to move themselves, as a watch, clock, &c.

AUTUMN, the third season of the year, when the harvest and fruits are gathered in. Hence, in the language of the Alchemists, it signifies the time when the philosophers stone is brought to perfection.

AUTUMN is represented, in painting, by a man at perfect age, cloathed like the vernal, and likewise girded with a starry girdle; holding in one hand a pair of scales equally poized, with a globe in each; in the other, a bunch of divers fruits and grapes. His age denotes the perfection of this season, and the ballance, that sign of the zodiac which the sun enters when our autumn begins.

AUTUMNAL, something relating to autumn. Thus,

AUTUMNAL *Point* is that point of the equinox from which the sun begins to descend towards the south-pole.

AUTUMNAL *Signs*, in astronomy, are the signs Libra, Scorpio, and Sagittarius, through which the sun passes during the autumn. See ZODIAC, LIBRA, &c.

AUTUMNAL *Equinox*, the time when the sun enters the autumnal point. See EQUINOX.

AUTUMNAL *Flowers*. See FLOWER.

AUX, the same with apogeum.

AUX also denoted the arch of the ecliptic, intercepted between the first degree of Aries and the apogeum.

AUXILIARY, *Auxiliaris*, whatever is aiding or helping to another.

AUXILIARY *Verbs*, in grammar, are such as help to form or conjugate others; that is, are prefixed to them, to form or denote the moods or tenses thereof. As *to have* and *to be*, in the English; *être & avoir*, in the French; *ho & sono*, in the Italian, &c.

In the English language, the auxiliary verb *am*, supplies the want of passive verbs. See PASSIVE.

AUXILIUM, in law, the same with aid. See AID.

AUXILIUM *Curiæ*, in law, a precept or order of court, to cite or convene one party at the suit of another.

AUXILIUM *ad filium militem faciendum, vel filiam maritandum*, a precept, or writ directed to the sheriff of every county where the king, or other lords, had any tenants, to levy of them reasonable aid towards the knighting his eldest son, or the marriage of his eldest daughter. See the article AID.

AWARD, in law, the judgment of an arbitrator, or of one who is not appointed by the law a judge, but chosen by the parties themselves for terminating their difference. See ARBITRATOR.

A-WEATHER, in the marine, the opposite term to a-lee. See the article A-LEE.

A-WEIGH, in the marine, the anchor is called a-weigh, or a-trip, when the cable, being drawn perpendicularly over it, and continued to be heaved into the ship, at length weighs or trips it out of the ground.

AWL, or AUL, among shoe-makers, an instrument wherewith holes are bored through the leather, to facilitate the stitching, or sewing the same. The blade of the awl is usually a little flat and bended, and the point ground to an acute angle.

AWME, or AUME, a Dutch liquid measure, containing eight steckans, or twenty verges or verteels, equal to the tierce in England, or to one sixth of a ton of France.

AWN, arista, in botany. See ARISTA.

AWNING, in the marine, a canopy of canvas extended over the decks in hot weather, to protect them from being split by the heat of the sun; likewise for the convenience of the officers, &c. An awning is supported by a range of wooden pillars, called stanchions, erected perpendicularly with the ship's side, on each side of the deck, and suspended in the middle by crowfeet. See the article CROWFOOT.

AX, or AXE, the same with axis.

AX, among carpenters, an instrument wherewith to hew wood.

This implement differs from the joiners hatchet, as being deeper and heavier.

AXILLA, in anatomy, the arm-pit, or the cavity under the upper part of the arm.

AXILLA, in botany, the space comprehended betwixt the stems of plants and their leaves.

AXILLARY, *Axillaris*, something belonging to, or lying near, the axilla. Thus,

AXILLARY *Artery* is that part of the subclavian branches of the ascending trunk of the aorta, which passeth under the arm-pits. See ARTERY.

AXILLARY *Glands* are situated under the arm-pits,

pits, enveloped in fat, and lie close by the axillary vessels.

AXILLARY *Vein*, one of the subclavian veins which passes under the arm-pit, dividing itself into several branches, which are spread over the arm. See VEIN.

AXIOM, in philosophy, is such a plain, self-evident, and received notion, that it cannot be made more plain and evident by demonstration; because it is itself better known than any thing that can be brought to prove it: as, that nothing can act where it is not; that a thing cannot be, and not be, at the same time: that the whole is greater than a part thereof; and that from nothing, nothing can arise.

By axioms, called also maxims, are understood all common notions of the mind, whose evidence is so clear and forcible, that a man cannot deny them, without renouncing common sense and natural reason.

The rule whereby to know an axiom, is this: Whatever proposition expresses the immediate clear comparison of two ideas without the help of a third, is an axiom. But if the truth does not appear from the immediate comparison of two ideas, it is no axiom.

These sort of propositions, under the name of axioms, have, on account of their being self-evident, passed not only for principles of science, but have been supposed innate, and thought to be the foundation of all our other knowledge, though, in truth, they are no more than identic propositions: for to say that all right angles are equal to each other, is no more than saying, that all right angles are right angles, such equality being implied in the very definition. All consideration of these maxims, therefore, can add nothing to the evidence or certainty of our knowledge of them; and how little they influence the rest of our knowledge, how far they are from being the foundation of it, as well as of the truths first known to the mind, Mr. Locke, and some others, have undeniably proved.

According to Bacon, it is impossible that axioms, raised by augmentation, should be useful in discovering new truths; because the subtilty of nature far exceeds the subtilty of arguments: but axioms, duly and methodically drawn from particulars, will again easily point out new particulars, and so render the sciences active.

The axioms in use being derived from slender experience, and in a few obvious particulars, are generally applied in a corresponding manner. No wonder, therefore, they lead us to few particulars; and if any instance unobserved before, happen to turn up, the axiom is preserved by some trifling distinction, where it ought rather to be corrected.

AXIOM is also an established principle in some art or science.

Thus it is an established axiom in physics, that nature does nothing in vain: so it is in geometry, that if to equal things you add equals, the sums will be equal. It is an axiom in optics, that the angle of incidence is equal to the angle of reflection, &c. In which sense too, the general laws of motion are called axioms: whence it may be observed, that these particular axioms are but deductions from certain hypotheses.

AXIS properly signifies that straight line in any plain figure at rest, about which the motion is performed, or the figure revolves, in order to produce, or generate a solid.

AXIS, in architecture, is a line in the Ionic capital, passing perpendicularly through the middle of the eye of the volute. See VOLUTE.

Spiral AXIS, in architecture, is the axis of a twisted column drawn spirally, in order to trace the circumvolutions without. See COLUMN.

AXIS, in astronomy; first, the axis of the world is a right line, conceived to pass through the center of the earth from one pole of the world to the other; this line is represented by the line 90, 90, Plate IV. *fig.* 6. in the armillary sphere, drawn from the artic pole to the antartic, through the earth in the center. About this line as an axis, the sphere in the Ptolemaic system is supposed to move or make its diurnal revolution.

AXIS *of a Planet*, is that line drawn through its center, about which the planet revolves. The sun, together with all the planets, except Mercury and Saturn, are known to revolve round their respective axis by observation. The earth's axis during its revolution round the sun, remains always parallel to itself, and is inclined to the plane of the ecliptic, making therewith an angle of $66\frac{1}{2}$ degrees. See PARALLELISM, &c.

The axis of the equator, ecliptic, horizon, meridian, &c. are right lines drawn through the centers of those circles, perpendicular to the planes of the said circles.

AXIS *of a Cone*, is a straight line or side about which a right-angled triangle moves, and by its rotation forms the cone. Only a right cone can properly be said to have an axis; for an oblique cone cannot be generated by the motion of a plain figure about a straight line at rest: but because it is plain from the definition, that the axis of a right cone is a straight line, drawn from the center of its base to the vertex; therefore, the writers on conic sections call likewise that line drawn from the center of the base of an oblique cone to the vertex, the axis of the cone.

AXIS *of a Conic Section*, is a right line dividing the section into two equal parts, and cutting all its ordinates at equal angles. Thus, if the line AB, (Plate XI. *fig.* 4.) be drawn to cut the ordinates *aa* and *bb* at right angles, and divide the section

into two equal parts, then is AB ſaid to be the axis of the ſection.

Tranſverſe Axis *in an Ellipſe*, is the right line AP, (Plate XI. *fig.* 1.) drawn through the center of the ellipſe, and is always the longeſt right line that can be drawn in the ellipſe.

Tranſverſe Axis *in the Hyperbola*, is the right line IT, (Plate XI. *fig.* 7.) cutting the curves in the point I and T.

Conjugate Axis *of an Ellipſe*, is the line BD, (*fig.* 1.) drawn through the center C, at right angles, to the tranſverſe axis PA; and in the hyperbola, it is the line MC, (Plate XI. *fig.* 6.) drawn through the center C, parallel to the ordinate OP.

Axis *of a Cylinder*, is that line either in an oblique or right cylinder, joining the center of the two baſes; or a line about which the parallelogram revolving forms the cylinder.

Axis *of a Balance*, in mechanics, is that line about which it moves.

Axis *of Oſcillation*, is a right line paſſing through the center about which a pendulum vibrates, and is parallel to the horizon.

Axis *in peritrochio*, a machine for raiſing weights, conſiſting of a wheel fixed on a cylinder for its axis. Thus, when a power by help of a rope, or any other means, is ſo applied to the circumference of a wheel, as to cauſe the ſaid wheel, together with its axis, to turn round, and raiſe a weight applied to the axle; ſuch a machine is called an axle in the wheel, or axis in peritrochio.

Let the circumference of the wheel be ABe, (Plate XVI. *fig.* 3.) and that of the axle DEc, each moving round the common center of motion C. Let the weight to be raiſed be P, and the moving power be M; then will M : P :: DC : CB; or in words thus, As the power is to the weight, ſo is the ſemidiameter of the axis to the ſemidiameter of the wheel; when the weight and power will be in equilibrum. Likewiſe the velocities of the power and weight will be to one another as the peripheries of the wheel and axle, and theſe are to one another as their diameters. The uſe of this machine is to raiſe weights to a greater height than the lever can do, becauſe the wheel is capable of being turned ſeveral times round, which the lever is not, and alſo to communicate motion from one part of a machine to another, by combining two or more of the axes in peritrochio together: thus Plate XVI. *fig.* 2. is a repreſentation of a machine thus combined; where W is a weight hanging to the axis GMB; P a weight or power acting at the point F, of the wheel IFK; NEQ the axle of the ſaid wheel, acting on the wheel HCL by teeth, and MBR of the wheel HCL.

Having given the diameter of the ſaid wheels and axles, with the power P to find the weight W, that will keep the weight or power P in equilibrio.

Rule.

The rectangle of the ſemidiameters of the two wheels, multiplied by the power, and that product divided by the rectangle of the ſemidiameter of the two axles, gives a quotient equal to the weight required.

If we put a=DF, b=DE, c=AC, d=AB, w=weight, and p=power, then we ſhall have the following theorems for finding the dimenſion of any one part of the machine, the others being ſuppoſed to be known. Thus,

$\frac{p\,a\,c}{b\,d} = w$. 1ſt.

$\frac{w\,b\,d}{a\,c} = p$. 2d.

$\frac{w\,b\,d}{p\,c} = a$. 3d.

$\frac{w\,b\,d}{p\,a} = c$. 4th.

$\frac{p\,a\,c}{w\,d} = b$. 5th.

$\frac{p\,a\,c}{w\,b} = d$. 6th.

But if we would have the machine to do the moſt execution in a given time, we diminiſh the weight w, $\frac{1}{3}$ of itſelf, and then we ſhall have it in the greateſt perfection poſſible, with the ſaid dimenſions. It muſt likewiſe be remembered in practice, that the ſemidiameter of the rope muſt be added to the dimenſions of the wheel or axle, about which it coils, and likewiſe that the power ſhould always act in the direction of a tangent to the curve, otherwiſe its power will be diminiſhed, according as it varies from that direction.

Axis, in optics, is that ray which is perpendicularly on the ſurface of the eye, and conſequently paſſes through its center.

Axis *of a Glaſs*, in optics, is a right line, connecting the middle points of the two oppoſite ſurfaces of the glaſs.

Axis *of Incidence*, in dioptrics, is a line perpendicular to the refracting ſurface in the point of incidence, and in the medium through which the ray of incidence paſſes.

Axis *of a Magnet*, is a line paſſing through the middle of a magnet length-wiſe, in ſuch manner, as that however the magnet be divided, provided the diviſion be made according to a plane wherein ſuch line is found, the loadſtone will be divided into two loadſtones, and the extremes of ſuch lines are called the poles of the ſtone.

Axis, in natural hiſtory, an animal of the deer kind, common in ſeveral parts of Africa. It is without horns; but has a tail reaching down to its hams.

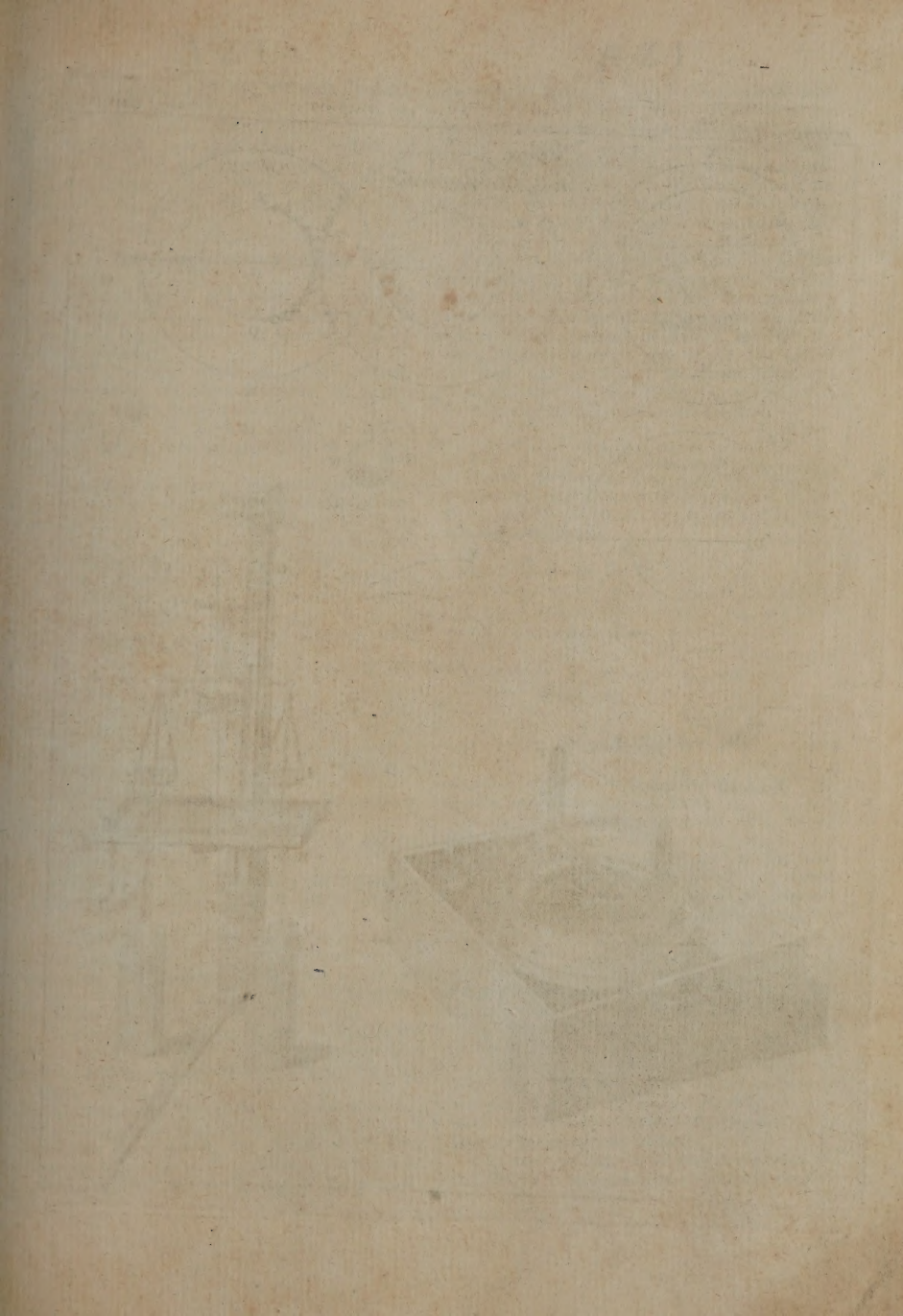
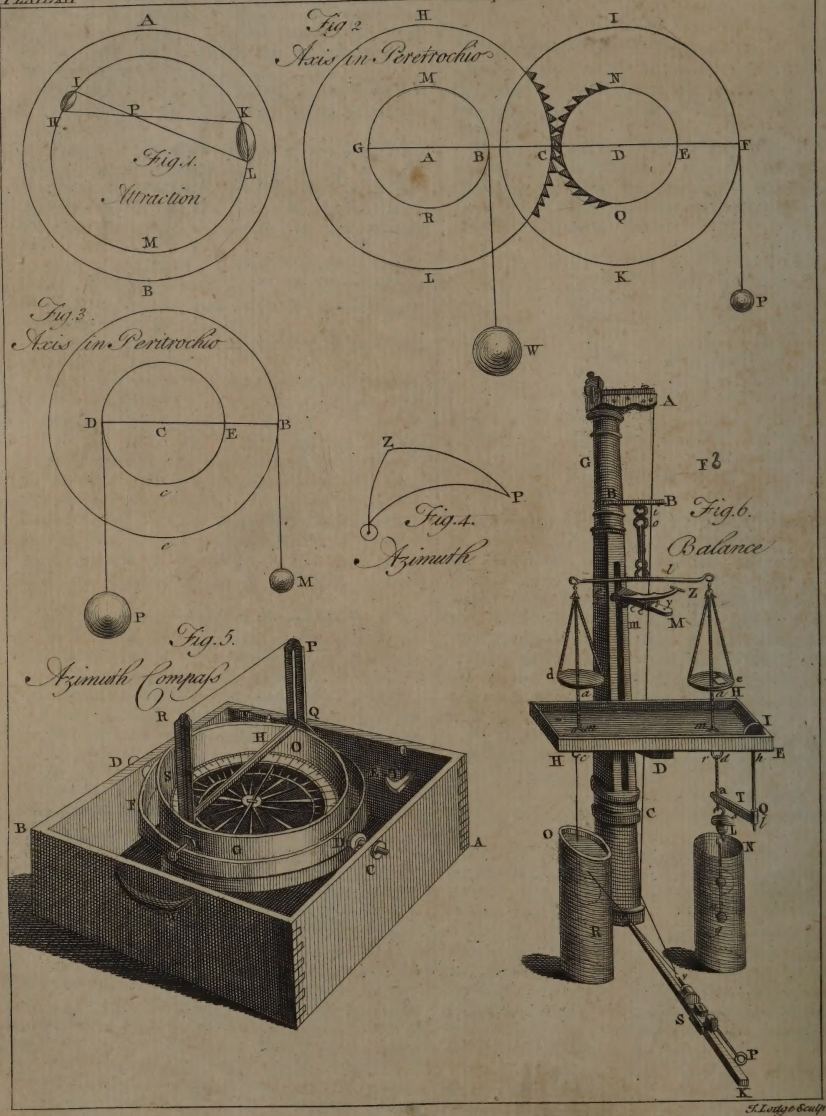


PLATE XVI



J. Lodge Sculpt

hams. The female is leſs than the male; but they are both full of red, yellow, and white ſpots, except the belly, which is entirely white.

AXUNGIA, in a general ſenſe, denotes old lard, or the drieſt and hardeſt of any fat in the bodies of animals; but, more properly, it ſignifies only hog's lard. See the articles FAT and LARD.

AXUNGIA *Vitri*, ſandiver, or ſalt of glaſs, a kind of ſalt which ſeparates from the glaſs while it is in fuſion.

AYEL, in law, a writ which lies where the grand-father was ſeized in his demeſne the day he died, and a ſtranger enters the ſame day, and diſpoſſeſſes the heir.

AYRY, or AERY *of Hawks*, a neſt or company of hawks, ſo called from the old French word *aire*, which ſignified the ſame.

AZAB, in the Turkiſh armies, a diſtinct body of ſoldiers, who are great rivals of the Janizaries.

AZALEA, in botany, a genus of pentandrious plants, bearing a monopetalous campanulated flower, divided at the ſummit into five ſegments; in the receptacle are inſerted five ſlender filaments topped with oblong bifid antheræ; the germen, which is roundiſh, ſupports a filiform ſtyle, crowned with an obtuſe ſtigma: the fruit is a roundiſh capſule, formed of five valves, and the ſame number of cells, containing a number of roundiſh ſmall ſeeds

One of the ſorts of azalea has much the appearance of the honey-ſuckle, and is as agreeably ſcented; the flower is white, and appears in July, but their ſeeds do not ripen in England; they are natives of North America, and are propagated here by ſhoots from their roots, and by laying their branches in autumn.

AZAZEL, the ſcape-goat, in Jewiſh antiquity. See SCAPE-GOAT.

AZEDARACH, the bead-tree, in botany. See the article MELIA.

AZEROLE, or L'AZAROLE, in botany, a ſpecies of the medlar. See the article MESPILUS.

AZIMUTH, in aſtronomy, is an arc of the horizon comprehended between the meridian and any great circle paſſing through the zenith and nadir, or the angle at the zenith contained between the ſaid meridian and vertical circle.

The azimuth of the ſun, planet, or ſtar, is the angle contained between the meridian and a vertical circle paſſing through the center of the ſun, planet, or ſtar.

The method of finding the ſun's azimuth at ſea, is by carefully obſerving his altitude with a Hadley's quadrant, and eſtimating the latitude of the ſhip, from the way it has made ſince the laſt obſervation of the meridian, or other altitudes for that purpoſe; likewiſe, by taking the ſun's declination from ſome Ephemerides, or correct tables. From hence we have the three ſides of a ſpherical triangle, to find one of the angles, which is the azimuth required. Thus, Z ⊙ (Plate XVI. *fig.* 4.) will be the complement of the altitude; ZP, the complement of the latitude; ⊙ P the complement of the ſun's declination; and ⊙ Z P, the angle or azimuth required; which is found by the following rule, viz.

From half the ſum of the three ſides, ſubtract the complement of the ſun's declination, or the ſide oppoſite the angle ſought, and note the remainder; then ſet down the arithmetical complements of the fine of the complements of altitude and latitude; and place under theſe the fine of the half ſum of the ſides, and the fine of the noted difference; then will half the ſum of theſe four logarithms be the coſine of half the azimuth required.

EXAMPLE.

Suppoſe the latitude in *per* reckoning be 40 degrees north, and the ſun's altitude obſerved 20 degrees, and his declination 20 degrees north, what will his azimuth be?

70° : 0′	Comp. of Decl^{n}.	
50 : 0	Comp. of Lat. - - -	0.1157460
70 : 0	Comp. of Alt. - - -	0.0270142
190 : 0	Sum of the ſides	
85 : 0	½ Sum - - - - - -	9.9983442
15 : 0	Diff. of ½ ſum and comp. of declination - - - -	9.4129962
	Sum =	19.5541006
53 : 11	+= fine comp. half Sum =	9.7770503

therefore, 53° : 11′ being doubled gives 106° : 22′ for the ſun's azimuth required.

To find the azimuth by the globe. See the article GLOBE.

Magnetical AZIMUTH, is an arch of the horizon, intercepted between the azimuth or vertical circle, paſſing through the center of any heavenly object and the magnetical meridian, which is found by obſerving the object with an azimuth-compaſs.

AZIMUTH-COMPASS, an inſtrument for finding either the magnetical azimuth or amplitude of an heavenly object.

The learned Dr. Knight invented ſome-time ſince a very accurate and uſeful ſea-compaſs, which is at preſent uſed in the navy, and will be deſcribed under the article COMPASS. This inſtrument, with the following contrivance added by the ingenious Mr. Smeaton, anſwers the purpoſe of an azimuth and amplitude-compaſs.

The cover of the wooden box being taken off, the compaſs is in a condition to be made uſe of in the

the bittacle, when the weather is moderate: but if the ſea runs high, as the inner box is hung very free upon its centers, (the better to anſwer its other purpoſes) it will be neceſſary to ſlacken the milled nut, placed upon one of the axes that ſupports the ring, and to lighten the nut on the outſide that correſponds to it. By this means, the inner box and ring will be lifted up from the edges, upon which they reſt, when free; and the friction will be increaſed, and that to any degree neceſſary, to prevent the too great vibrations, which otherwiſe would be occaſioned by the motion of the ſhip.

To make the compaſs uſeful in taking the magnetic azimuth, or amplitude of the ſun and ſtars, as alſo the bearings of headlands, ſhips, and other objects at a diſtance, the braſs edge, deſigned at firſt to ſupport the card, and throw the weight thereof as near the circumference as poſſible, is itſelf divided into degrees and halves; which may be eaſily eſtimated into ſmaller parts, if neceſſary. The diviſions are determined by means of a cat-gut line, ſtretched perpendicularly with the box, as near the braſs-edge as may be, that the parallax, ariſing from a different poſition of the obſerver, may be as little as poſſible.

Underneath the card are two ſmall weights, ſliding on two wires, placed at right angles to each other, which being moved nearer to, or farther from, the center, counterbalance the dipping of the card in different latitudes, or reſtore the equilibrium of it, where it happens by any other means to be got too much out of level.

There is alſo added an index at the top of the inner box, which may be put on and taken off at pleaſure; and ſerves for all altitudes of the object. It conſiſts of a bar, equal in length to the diameter of the inner box, each end being furniſhed with a perpendicular ſtile, with a ſlit parallel to the ſides thereof; one of the ſlits is narrow, to which the eye is applied, and the other is wider, with a ſmall cat-gut ſtretched up the middle of it, and from thence continued horizontally from the top of one ſtile to the top of the other. There is alſo a line drawn along the upper ſurface of the bar. Theſe four, viz. the narrow ſlit, the horizontal cat-gut thread, the perpendicular one, and the line on the bar, are in the ſame plane, which diſpoſes itſelf perpendicularly to the horizon, when the inner box is at reſt, and hangs free. This index does not move round, but is always placed on, ſo as to anſwer the ſame ſide of the box.

When the ſun's azimuth is deſired, and his rays are ſtrong enough to caſt a ſhadow, turn about the wooden box, till the ſhadow of the horizontal thread, or (if the ſun be too low) till that of the perpendicular thread, in one ſtile, or the light through the ſlit in the other, falls upon the line in the index bar, or vibrates to an equal diſtance on each ſide of it, gently touching the box, if it vibrates too far: obſerve, at the ſame time, the degree marked upon the braſs edge by the cat-gut line. In counting the degree for the azimuth, or any other angle that is reckoned from the meridian, make uſe of the outward circle of figures upon the braſs edge; and the ſituation of the index bar, with regard to the card and needle, will always direct upon what quarter of the compaſs the object is placed.

But if the ſun does not ſhine out ſufficiently ſtrong, place the eye behind the narrow ſlit in one of the ſtiles, and turn the wooden box about, till ſome part of the horizontal, or perpendicular thread appears to interſect the center of the ſun, or vibrate to an equal diſtance on each ſide of it, uſing ſmoked glaſs next the eye, if the ſun's light is too ſtrong. In this method, another obſerver will be generally neceſſary, to note the degree cut by the nonius, at the ſame time the firſt gives notice that the thread appears to ſplit the object.

From what has been ſaid, the other obſervations will be eaſily performed; only, in caſe of the ſun's amplitude, take care to number the degree by the help of the inner circle of figures on the card, which are the complements of the outer to 90°; and, conſequently, ſhew the diſtance from eaſt or weſt.

The azimuth of the ſtars may alſo be obſerved by night; a proper light ſerving equally for one obſerver to ſee the thread, and the other the degree upon the card.

It may not be amiſs to remark farther, that, in caſe the inner box ſhould loſe its equilibrium, and, conſequently, the index be cut off the plane of a vertical circle, an accurate obſervation may ſtill be made, provided the ſun's ſhadow is diſtinct; for, by obſerving firſt with one end of the index towards the ſun, and then the other, a mean of the two obſervations will be the truth.

Plate XVI. *fig.* 5. is a perſpective view of the compaſs, when in order for obſervation; the point of view being the center of the card, and the diſtance of the eye two feet.

A B is the wooden box.

C and D are two milled nuts, by means whereof the axis of the inner box and ring are taken from their edges, on which they move, and the friction increaſed, when neceſſary.

E E is the ring that ſupports the inner box.

G H is the inner box; and

I is one of its axes, by which it is ſuſpended on the ring E E.

The magnet or needle appears paſſing through the center, together with a ſmall brace of ivory, that confines the cap to its place.

The card is a ſingle varniſhed paper, reaching

as far as the outer circle of figures, which is a circle of thin braſs; the edge whereof is turned down at right angles to the plane of the card, to make it more ſtiff.

O is a cat-gut line, drawn down the inſide of the box, for determining the degree upon the braſs edge.

PQRS is the index bar, with its two ſtiles and cat-gut threads; which being taken off from the top of the box, is placed in two pieces, T and V, notched properly to receive it.

W is a place cut out in the wood, ſerving as an handle.

AZIMUTH *Dial*, one whoſe ſtyle or gnomon is at right angles to the plane of the horizon.

AZIMUTH *Circles*, commonly called vertical circles, are great circles of the ſphere interſecting each other in the zenith and nadir, and cutting the horizon in every point at right angles. Theſe azimuths are repreſented on the globe by the braſs quadrant of altitude, and on the common ſea-charts by the rumbs. On the azimuth circles is reckoned the altitude or height of heavenly objects, when not in the meridian.

AZOGA SHIPS, are thoſe Spaniſh ſhips commonly called the quickſilver ſhips, from their carrying quickſilver to the Spaniſh Weſt-Indies, in order to extract the ſilver out of the mines of Mexico and Peru. Theſe ſhips, ſtrictly ſpeaking, are not to carry any goods unleſs for the king of Spain's account.

AZONI, ἄζωνοι, in ancient mythology, a name applied by the Greeks to ſuch of the gods as were deities at large, not appropriated to the worſhip of any particular town or country, but acknowledged in general by all countries, and worſhipped by every nation. Theſe the Latins called *dii communes*. Of this ſort were the Sun, Mars, Luna, &c.

AZOTH, in ancient chemiſtry, the firſt matter of metals, or the mercury of a metal; more particularly that which they call the mercury of philoſophers, which they pretend to draw from all ſorts of metallic bodies.

The azoth of Paracelſus, which he boaſted of as an univerſal remedy, is pretended to be a preparation of gold, ſilver, and mercury.

AZURE, in a general ſenſe, the blue colour of the ſky. See SKY and BLUE.

AZURE, among painters, the beautiful blue colour, with a greeniſh caſt, prepared from the lapis lazuli, generally called ultramarine.

With greater propriety, however, azure ſignifies that bright blue colour, prepared from the lapis armenus, a different ſtone from the lapis lazuli, though frequently confounded together. This colour is, by our painters, commonly called Lambert's blue.

AZURE, in heraldry, the blue colour in the arms of any perſon below the rank of a baron. In the eſcutcheon of a nobleman, it is called ſaphire; and in that of a ſovereign prince, Jupiter. In engraving, this colour is expreſſed by lines, or ſtrokes drawn horizontally.

AZURIUM, the name of a chemical preparation from two parts of mercury, one of ſulphur, and a fourth of ſal ammoniac, mixed in a mortar, put into a glaſs veſſel, and ſet over the fire till a bluiſh ſmoke ariſes, &c.

AZYGOS, in anatomy, a vein riſing within the thorax on the right ſide, having no fellow on the left; whence it is called azygos, or vena ſine pari.

It is extended through the right ſide of the cavity of the thorax, and being deſcended to the eighth or ninth vertebra, it then begins to keep the middle, and ſends forth on each ſide intercoſtal branches to the interſtices of the eight loweſt ribs; being then divided into two branches, of which the larger deſcends to the left, betwixt the proceſſes of the diaphragm, and is inſerted ſometimes into the cava, above or below the emulgent, but oftener joined to the emulgent itſelf. The other, which goes down on the right ſide, enters the cava, commonly a little above the emulgent, but is very ſeldom joined to the emulgent itſelf.

AZYMITES, azymitæ, in church-hiſtory, Chriſtians who adminiſter the euchariſt with unleavened bread.

The word is formed from the Greek, α, priv. and ζύμη, ferment.

This appellation is given to the Latin by the Greek church, becauſe the members of the former uſe fermented bread in the celebration of the euchariſt. They alſo call the Armenians and Maronites by the ſame name, and for the ſame reaſon.

AZYMOUS, ſomething unfermented, or made without leaven; as unleavened bread. Sea-biſket is of this kind; and therefore, according to Galen, leſs wholeſome than bread that has been fermented.

B.

B The ſecond letter of the Engliſh and moſt other alphabets, ancient and modern, except the old Iriſh, where it is the firſt, and the Abyſſinian, in which it is the ninth.

B, among the ancients, was a numeral letter, and with the Hebrews and Greeks denoted 2; but with the Romans 300, and with a daſh over it 3000.

B. A. ſignifies batchelor of arts, B. L. batchelor of laws, and B. D. batchelor of divinity.

BAAL, or BEL, an Hebrew and Chaldaic word, which ſignifies lord, or mighty. It was the name of the idol of the Moabites and Phœnicians, and moſt of the nations that bordered upon the Jews. Perhaps the idolators pretended to adore the true God under the name and figure of Baalim. The Grecians, who were accuſtomed to take the eaſtern divinities for their own, called this idol Jupiter, and ſometimes Mars; but the Babylonians underſtood by it either the ſtars and hoſt of heaven, or ſuch kings and heroes whoſe memory they had conſecrated to poſterity by a religious worſhip. The Phœnicians adored the ſun under the names of Baal and Moloch. It is thought this idol was firſt invented by ſuperſtition, and the original worſhip of idolatry. *Selden de Diis Syriis.*

BABBLING, among ſportſmen, is ſaid of hounds which are too buſy after they have found a good ſcent.

BABOON, in natural hiſtory, a large kind of ape, common in the Eaſt and Weſt-Indies. The head is large, and the mouth furniſhed in a particular manner with whiſkers; the face is naked, but the back part of the head hairy. It has a very ſhort tail, and is of a dark olive colour.

BABYLONISH, or BABYLONIAN, ſomething belonging or peculiar to Babylon. Thus we meet with Babyloniſh epocha, hours, &c. See EPOCHA, HOUR, &c.

BACCA, in botany, the Latin appellation for a berry: it implies a round fruit, for the moſt part ſoft and covered with a thin ſkin, and contains ſeeds in a pulpy ſubſtance; but if it be harder, or covered with a thicker ſubſtance, it may with more propriety be called pomum, or apple. Berries which grow ſcattered upon trees and ſhrubs are diſtinguiſhed from acini, which are berries hanging in cluſters. See the article ACINUS.

Theſe berries are of various forms, ſizes, properties, and uſes, according to the plants on which they grow: ſome are uſed in dying, as French berries, a ſpecies of the lycium; the moſt remarkable in the materia medica are, *baccæ alkekengi*, *baccæ juniperi*, *baccæ myrti*, and *baccæ agni caſti*. See the properties of each under its reſpective article.

BACCHANALIA, feaſts celebrated in honour of Bacchus, by the ancient Greeks and Romans.

Two of theſe feaſts were particularly remarkable, and diſtinguiſhed by the epithets *greater* and *leſſer*. The latter were held in the open fields during the autumn; but the former were celebrated in the city about the vernal equinox.

Both theſe feaſts were accompanied with games, ſpectacles, and theatrical repreſentations; and it was alſo at theſe feſtivals that the poets contended for the prize of poetry. Some of thoſe who were initiated into the Bacchanalia repreſented Silenus; others Pan; others Satyrs; and in this manner appeared in public day and night, counterfeiting drunkenneſs, dancing obſcenely, committing all kinds of licentiouſneſs and debauchery, and running over the mountains and through the foreſts, with horrible ſhrieks and howlings, crying out, Evoi Βακχε, or Iω Βακχε.

Livy informs us, that, during the Bacchanalian feaſts at Rome, ſuch ſhocking diſorders were practiſed under the cover of the night, and which thoſe who were initiated were bound by the moſt horrid oaths to conceal, that the ſenate were obliged to interpoſe their authority, by ſuppreſſing them firſt at Rome, and afterwards throughout all Italy.

BACCHARIS, in botany, a genus of plants whose flower is compoſed of many hermaphrodite and female florets: the hermaphrodite are quinquefid and funnel-ſhaped, and contain five ſmall hairy filaments crowned with cylindrical antheræ: the germen is ovated, ſupporting a filiform ſtyle; and the calyx (which is cylindrical and imbricated) incloſes a ſhort oblong ſolitary ſeed crowned with ſimple down. The female florets have no ſtamina, but in other reſpects are the ſame as the hermaphrodite. There are two ſpecies in this genus, one of which is known by the name of African tree groundſel, with a ſawed leaf; it is a native of ſeveral parts of America, and has been long preſerved in England by the curious: the other ſort, called the Virginia groundſel tree, is a ſhrub which grows about ſeven or eight feet high, and produces here white flowers in October, and the leaves are evergreen. Both ſorts may be multiplied, by cuttings, in the ſummer months.

BACCHIUS, in ancient poetry, a kind of foot compoſed of two long and a ſhort ſyllable, as the word *āvārī*. It has its name from the god Bacchus, becauſe it frequently occurred in the hymns compoſed in honour of that deity.

BACCHUS, in mythology, a pagan deity, the inventor or god of wine. He is feigned to have been the ſon of Jupiter and Semele; and is ſaid to have been the firſt that yoked oxen to the plough.

BACCIFEROUS, (from *Bacca*, a berry, and *fero*, to bear) in botany, are ſuch plants as bear berries.

Mr. Ray divides bacciferous trees into four kinds. 1. Such as bear a calicute, or naked berry, the flower and calyx both falling off together, and leaving the berry bare; as the ſaſſafras, &c.

2. Such as have a naked but polypyreneous fruit; that is, containing two or more kernels or ſeeds within it; as the jaſmine, privet, &c.

3, Such as have a naked polypyreneous fruit; that is, containing in it ſeveral ſeeds; as the arbutus, &c.

4. Such as have their fruit compoſed of ſeveral acini, or ſoft round balls, ſet cloſe together like a bunch of grapes; as the honey-ſuckle, &c.

BACHELOR, or BATCHELOR. See BATCHELOR.

BACK, in anatomy; ſee DORSUM.

BACK-ASTERN, in rowing, to ply the oars in ſuch a manner that the boat or veſſel ſhall move ſtern-foremoſt, contrary to her uſual motion.

BACK-BOARD *of a Boat*, a piece of board ſtretching acroſs the hinder-part of any boat, for the paſſengers to recline againſt.

BACKING *the Sails*, in the marine, to diſpoſe them in a ſituation that will force the ſhip to retreat, or impel her backwards: this, however, is only done in narrow channels, when a ſhip is carried along ſideways by the tide or current, and wants to avoid any object that may intercept her progreſs, as ſhoals, veſſels at anchor, &c. or in the line of battle, when a ſhip wants to lie immediately oppoſite to ſome other with whom ſhe is engaged, or is too far advanced for her ſtation. See ABACK; alſo FILL, SHIVER, VEER.

BACK-BONE. See VERTEBRA.

BACK-PAINTING, the method of painting mezzotinto prints, paſted on glaſs, with oil-colours.

The art conſiſts chiefly in laying the print upon a piece of crown glaſs, of ſuch a ſize as fits the print.

In order to do this, take your print and lay it in clean water for two days and two nights, if the print be on very ſtrong, cloſe, and hard gummed paper; but if upon an open, ſoft, ſpungy paper, two hours will ſometimes ſuffice, or more, according as the paper is.

The paper or picture having been ſufficiently ſoaked, take it out and lay it upon two ſheets of paper, and cover it with two more; and let it lie there a little to ſuck out the moiſture.

In the mean time, take the glaſs the picture is to be put upon, and ſet it near the fire to warm; take Straſburg turpentine, warm it over the fire till it is grown fluid; then with a hog's-hair-bruſh ſpread the turpentine very ſmoothly and evenly on the glaſs.

When this has been done, take the mezzotinto print from between the papers, and lay upon the glaſs; beginning firſt at one end, rubbing it down gently as you go on, till it lie cloſe, and there be no wind bladders between.

Then, with your fingers, rub or roll off the paper from the back-ſide of the print, till it looks black, i. e. till you can ſee nothing but the print, like a thin film, left upon the glaſs, and ſet it by to dry.

When it is dry, varniſh it over with ſome white tranſparent varniſh, that the print may be ſeen through it, and then it is fit for painting.

The utmoſt care will be neceſſary in rubbing or rolling the paper off the print, ſo as not to tear it, eſpecially in the light parts.

You may, inſtead of ſoaking your prints two days and two nights, roll them up and boil them for about two hours, more or leſs, according to the quality of the paper, in water, and that will render it as fit for rubbing, rolling, or peeling, as the other way.

This being done, and your oil colours prepared, ground very fine, and tempered up very ſtiff, lay on the back-ſide of the tranſparent prints ſuch colours as each particular part requires; letting the maſter-lines of the prints ſtill guide your pencil, and ſo each particular colour will lie fair to the eye on the other ſide of the glaſs, and look almoſt as well as a painted piece, if it be done neatly.

The ſhadows of the print are generally ſufficient for the ſhadow of every colour; but if you have a mind

mind to give a ſhadow by your pencil, then let the ſhadows be laid on firſt, and the other colours afterward.

In laying on colours in this kind of back-painting, you need not be curious as to the laying them on ſmooth. This is not at all requiſite here, where the chief aim is only to have the colours appear well on the fore-ſide of the print; and therefore the only care to be uſed in this work, is to lay the colours on thick enough, that its body may ſtrike the colour of it plainly through the glaſs.

BACK-STAFF, the ſame with Davis's Quadrant. See *Davis's* QUADRANT.

BACK-STAYS, in the marine, ropes that reach from the top-maſt-heads down to the outſide of the ſhip, when they are ſtretched extremely tight: two of them are generally formed of one rope; the middle part of which is fixed on the maſt-head: their uſe is to ſupport the maſts, and keep them from bending too much when they are preſſed by a load of ſail, againſt the impulſe of which they act with a counter-force.

BACON's *Philoſophy*, the philoſophy propoſed and recommended by lord Bacon.

That great genius was born in the year 1560, and gave marks in his youth of what his manhood would produce. Queen Elizabeth was an admirer of his remarkable ſagacity. He ſtudied the Ariſtotelian philoſophy at Cambridge; and, before he was ſixteen years of age, diſcovered the abſurdity of that jargon in vogue at that time. He afterwards applied himſelf to the ſtudy of the law; and his merit raiſed him to the dignity of lord chancellor, under king James I. He was accuſed of bribery; and, the king refuſing him protection, was fined by the houſe of lords, ſtripped of his chancellorſhip, and caſt into priſon. He was ſoon after reinſtated in his honours and fortunes; but what he had undergone gave him a diſlike to buſineſs, and increaſed his paſſion for ſtudy. At laſt he died aged 66 years, poor, and in very mean circumſtances.

No man has contributed more to the advancement of learning than lord-chancellor Bacon: he ſaw the imperfection of the philoſophy of the ſchools, and taught the only way to amend it. This great man, indeed, did not know nature; but he knew and pointed out all the ways that led to her. He entertained an early contempt for what the univerſities called philoſophy; and did every thing in his power to prevent ſocieties, inſtituted for the improvement of human reaſon, from continuing to ſpoil it by a heap of impertinent terms, ſubſtantial forms, &c. which had not only made ignorance to be reverenced, but was, by a ridiculous mixture with religion, rendered ſacred.

He compoſed two works with a deſign to improve the ſciences, and carry them to perfection. In the firſt, intitled *de Augmentis Scientiarum*, he ſhews the ſtate of learning, and points out a method of carrying it to greater perfection; but adds, that we muſt never hope to carry our diſcoveries to any great length, unleſs other methods were purſued than thoſe then in uſe. He ſhews that the logic then taught in the ſchools, was fitter for wrangling than to direct the mind in its ſearch after truth. Ariſtotle, ſays he, from whom we have this art, has proceeded on wrong principles; he has made his phyſics conformable to his logic, inſtead of making his logic conformable to his phyſics; and thus overturning the order of nature, has ſubjected the end to the means.

To correct the faults in the common logic, Bacon compoſed a ſecond work, intitled *Organum Scientiarum*, wherein he has taught a new logic, the principal end of which is to ſhew how to make a good induction, as the end of Ariſtotle is how to make a good ſyllogiſm. Bacon looked on this as his maſter-piece, and ſpent eighteen years in compoſing it.

Nor was the cauſe of our errors hid from this great man; he ſaw that our ideas were operations of the mind; and that, in order to diſcover truth, they muſt be directed in a new method.

This advice he frequently repeats in the work juſt mentioned. But who, in an age ſo prejudiced in favour of the jargon of the ſchools, and the notions of innate ideas, liſtened to his doctrine? Who did not look on his new method of improving the human underſtanding, as a chimerical project? The method Bacon propoſed was too perfect to be accepted at once: errors of long ſtanding maintain their poſt with ſome obſtinacy; and the Carteſian philoſophy was embraced, becauſe it admitted ſome of the former errors. Beſides, lord Bacon's employment took up much of his time, and prevented him from carrying into execution himſelf the advice he gave to others: whereas Deſcartes gave himſelf up entirely to philoſophy; and, being a man of a very lively and fruitful imagination, has ſubſtituted in the room of the errors of the ſchools, others of a more ſeducing nature.

Lord Bacon's attention to the ſciences in general did not hinder him from applying to ſome in particular; and as he thought natural philoſophy the baſis of all the other ſciences, he principally applied himſelf to bring that to ſome degree of perfection: but in this he acted like ſome great architects, who, ſcorning to work after others, begin with pulling every thing down, and raiſe their building on a plan entirely new. He, like theſe, never thought once about embelliſhing or repairing what had been already begun by others; but propoſed to eſtabliſh a new ſyſtem of phyſics, without making any uſe of what had been left us by the ancients, whoſe principles he ſuſpected. To accompliſh this great deſign, he reſolved to publiſh a phyſical treatiſe every month; and began with one upon the Winds: he afterwards publiſhed one on Heat; another on Motion;

tion; and, at last, one on Life and Death. But as it was impossible for a single man to give a compleat system of physics in general, with equal exactness, after having given directions to serve as a rule for those who were desirous of proceeding on his principles, he contented himself with drawing the out-lines of four other treatises, and furnished materials for them, in a work, intitled *Sylva Sylvarum*, wherein he has collected a vast number of experiments, to serve as a foundation for his new physics. In short, before Lord Bacon, nobody knew any thing of natural philosophy; and all the experiments made since his time seem to have been pointed out by this great genius.

His moral essays are much esteemed; but they are wrote rather to instruct than entertain: an easy genius, a sound judgment, the sensible philosopher, and man of reflection, shine in these essays by turns. This was one of the fruits of the retreat of a man who had quitted the world, after having long supported a great share in its prosperity and adversity. There are also some very fine things in his book concerning the wisdom of the ancients, wherein he has moralized the fables which compose the mythology of the Greeks and Romans.

He wrote, besides, the History of Henry VII. in which, notwithstanding there are some traces of the bad taste of his age, yet it abounds in judicious remarks, and shews he was a refined politician, as well as a great philosopher.

BACULÆ, in fortification, a kind of portcullis, or gate, made like a pitfall with a counterpoise, and supported by two strong stakes. It is usually erected before the corps de gard, not far from the gate of a place.

BACULOMETRY, according to some, is the art of measuring accessible or inaccessible heights, by the help of staves.

The word is formed from the Latin, *baculus*, a staff; and the Greek, μετρεω, to measure.

BADGE, in naval architecture, an ornament placed on the outside, very near the stern of small ships, containing either a window for the convenience of the cabin, or the representation of it: it is commonly decorated with marine figures, martial instruments, &c. &c. See STERN.

BADGER, *Taxus*, or *Meles*, in natural history, the name of an animal very common in many parts of England.

It has a thick shortish body, with a very short neck, and coarse hair, nearly resembling that of a hog. On the back it is of a palish yellow at the roots, in the middle brown or black, and yellow at the ends; insomuch that at first sight the creature appears to be of a blackish grey. On the sides and under the belly the hair is entirely of a pale yellow; and on the shoulders, legs, as well before as behind, and under the throat, he is quite black. From the top of the head there is a white line or stripe two inches broad; and below it, on each side the nostrils, about the eyes, and farther than the ears, there is a black space or stripe in the shape of a pyramid; and below that again, on both jaws, the hair is white, which render the whole head of a pied colour.

The tail is short and thick, beset with strong longish hair, and the ears are short, roundish, and resemble those of a rat. The eyes are small in proportion to the body, and the muzzle is like that of a dog. The tongue is of a middle size, the legs short, and the teeth like those of a dog. The fore-feet are armed with very long claws, with which it makes holes in the earth; and the head is in shape nearly like that of a fox; for from a broad base, it ends in a sharp muzzle, which renders it almost of a triangular figure. The jaws, or cheeks, are full and tumid, on account of the thickness of the muscles; for which reason this creature bites very hard.

He lives upon beetles and other insects; for in his stomach, which is very large, great numbers of these have been found, mixed with the roots of grass. Some say he feeds upon apples and grapes; and that he is fond of rabbits, geese, fowls, and other birds; but, of this, little can be said with any certainty. He has none of the gross intestines; nor no blind gut, at least none could be found; but the kidnies are pretty large. The greatest peculiarity is a large orifice directly under the tail, above the passage for the excrements: it is a sort of a bag, or purse, which is hairy within, and full of a white substance of a thick consistence. Sometimes it is very small in quantity, and has no sensible smell. The external part of this purse is covered with conglomerate glands on all sides. Besides this cavity, there are two larger glands near the anus, which are hollow within, and full of a sort of fat of a strong smell, which empty themselves by two holes into the gut. The gall-bladder is long; and there are three biliary ducts which belong to three distinct vessels; that is, there are three biliary passages that concur with the cystic duct.

The burrows that he makes in the earth are not only for his own safety, but for the sake of getting his food; for he finds a great many insects under the earth, as well as the roots of plants. The parts of England in which he chiefly abounds at present, are Essex, Sussex, and some of the midland counties.

The flesh of a badger is said to be good eating, and to taste like that of a boar. The fat is emollient, warm, and penetrating; and is thought to be good to ease pains in fits of the gravel.

White BADGER, an animal sometimes seen in New-York; from the tip of the nose to the end of the tail is a foot and nine inches in length. The eyes are small in proportion to the size, and the ears short; the legs are also very short, with white claws. The whole body is covered with very thick

hair, which is white on the back, and of a whitish yellow on the lower parts.

The badger of Surinam is about a foot and a half long, with short ears, a roundish head, longish muzzle, and short legs. The claws are black, long, and crooked: and the whole body, except the belly which is yellow, is covered with hair of a deep chesnut colour inclining to black; but the fore-part of the head is not of so deep a colour; and the tail, which is as long as the body, is brown, and as it were striped with yellow.

BADGER, in old law books, a person licensed to purchase corn at one place, and sell it at another, without incurring the penalty of an engrosser.

BADIANE, or BADIAN, the seed of a tree growing in China. It has the smell of aniseed; and is used by the Chinese to give their tea an aromatic taste.

BÆCKEA, in botany, a genus of octandrious plants, producing a flower with a monophyllous funnel-shaped calyx, in which is inserted five roundish petals; it contains eight short filaments, topped with small egg-shaped antheræ; the germen is roundish, supporting a filiform style, and afterwards becomes a globose capsule of five cells containing roundish seeds.

BÆTYLIA, anointed stones, worshipped by the Phœnicians. They were commonly of a black colour, and consecrated to some god, as Saturn, Jupiter, the Sun, &c.

The memory of Jacob's setting up the stone he had used for a pillow, pouring oil on the top of it, and calling the place Bethel, seems to have been preserved under the bætulia, or anointed stones, of the Phœnicians. Damascius, a pagan writer in the time of Justinian, tells us, that he had seen on Mount Libanus, near Heliopolis in Syria, several of these stones, of which many wonderful things were reported.

BAFFETAS, or BAFTAS, a cloth made in the East-Indies, from coarse white cotton thread. Those of Surat are reckoned the best. They are from thirteen French ells and three quarters to fourteen long, and seven eighths broad. There are also some which measure but five sixths of an ell, or even but half of an ell in breadth. These narrow baffetas are called Orgagis, Gaudivis, Nerindes, and Labouis, according to the names of the places where manufactured.

There are also narrow white baffetas, which measure thirteen ells and an half in length, by half an ell in breadth; broad white baffetas, fourteen ells by three quarters.

Broad-brown and narrow-brown baffetas are made of raw thread; that is, thread before it has been bleached. The former are fourteen ells long, by half an ell broad; the latter of the same length, and three quarters in breadth.

BAG, in commerce, a term signifying a certain quantity of some particular commodity; as a bag of almonds, for instance, is about three hundred weight; of aniseeds, from three to four hundred, &c.

Bags are used, in most countries, to put several sorts of coin in, either of gold, silver, brass, or copper. Bankers, and others, who deal much in current cash, label their bags of money, by tying a ticket or note at the mouth of the bag, signifying the coin therein contained, the sum total, its weight, and of whom it was received. Tare is allowed for the bag.

BAG, among farriers, is when, in order to retrieve a horse's lost appetite, they put an ounce of assa-fœtida, and as much powder of savin, into a bag, to be tied to the bit, keeping him bridled for two hours, several times a day: as soon as the bag is taken off, he will immediately eat. The same bag will serve a long time.

BAGGAGE, is particularly used, in the military art, for the necessaries, utensils, apparel, &c. of the officers and soldiers.

The baggage includes also women, children, suttlers, &c. The baggage-waggons before a march are appointed a rendezvous, where they are marshalled by the waggon-master general, according to the rank the several regiments bear in the army. On a march, they are sometimes ordered to follow the respective columns of the army, sometimes to follow the march of the artillery, and sometimes to make a column of themselves. The general's baggage is commonly first. If the army march from the right, the baggage of that wing has the van; if from the left, the baggage of the left has the van. Each waggon has a distinguishing flag, to shew to what regiment it belongs. *Guillet.*

BAGNIO, an Italian word, signifying a bath: we use it for a house with conveniencies for bathing, cupping, sweating, and otherwise cleansing the body; and sometimes for worse purposes.

BAGNIO is, in Turky, become a general name for the prisons where their slaves are inclosed, it being usual in these prisons to have baths.

BAGNOLIANS, *Bagnolenses*, in church-history, a sect of heretics, who in reality were Manichees, though they somewhat disguised their errors. They rejected the Old Testament, and part of the New; held the world to be eternal, and affirmed that God did not create the soul when he infused it into the body.

BAGPIPE, a musical instrument of the wind kind, chiefly used in country places, especially in the North: it consists of two principal parts; the first a leathern bag, which blows up like a football, by means of a port-vent, or little tube, fitted to it, and stopped by a valve: the other part consists of three pipes or flutes, the first called the great

great pipe, or drone; and the ſecond, the little one; which paſs the wind out only at the bottom: the third has a reed, and is played on by compreſſing the bag under the arm, when full, and opening or ſtopping the holes, which are eight, with the fingers. The little pipe is ordinarily a foot long; that played on, thirteen inches; and the port-vent ſix.

BAHAR, or BARR, a weight uſed in Ternate, Mocha, in the Moluccas, Achem, and divers other parts of the Eaſt-Indies.

There are two kinds, the great, wherewith ſpice is weighed, equivalent to 200 catis, at 26 taels to the cati, amounting to 481 pounds 4 ounces, Paris meaſure.

The little bahar ſerves for the weighing quick-ſilver, vermilion, ivory, ſilk, muſk, and other precious wares, containing likewiſe 200 catis, but at 22 taels to the cati, amounting to about 401 pounds ſeven ounces, Paris meaſure. The Chineſe bahar is 300 catis, but each cati only equal to 16 taels.

BAHIR, a Hebrew term ſignifying famous or illuſtrious; but particularly uſed for a book of the Jews, treating of the profound myſteries of the cabala, being the moſt ancient of the rabbinical works.

BAIL, in law, the ſetting at liberty one arreſted, or impriſoned, upon an action, either civil or criminal, upon ſureties taken for his appearance at a day and place aſſigned; and is either common or ſpecial.

Common bail is in actions of ſmall prejudice, or ſlight proof, in which caſe any ſureties are taken.

Special bail is that given in caſes of greater moment, where it is required that the ſureties be ſubſidy-men at leaſt, and according to the matter in queſtion.

It was ſome years ago enacted, that no perſon ſhould be held to ſpecial bail in any action brought for leſs than ten pounds: but this is only obſerved as to writs iſſued out of the courts of Weſtminſter-Hall; for the marſhal's court continues to arreſt and hold to ſpecial bail in actions exceeding forty ſhillings.

By the indulgence of the common-law, all perſons might be bailed till they were convicted of the offence laid to their charge: but it is enacted, by ſtatute, that murderers, outlaws, houſe-burners, thieves, openly defamed, ſhall not be bailed. However, this ſtatute does not extend to the court of the king's-bench, which bails in all caſes whatſoever, and may bail even for murder, &c.

Clerk of the BAILS is an officer belonging to the court of king's-bench: he files the bail-pieces taken in that court, and attends for that purpoſe.

BAILE, or BALE, in the ſea-language. The ſeamen call throwing the water by hand out of the ſhip or boat's hold, bailing. They alſo call thoſe hoops that bear up the tilt of a boat, its bails.

BAILEMENT, in law, the delivery of things, whether writings or goods, to another, ſometimes to be delivered back to the bailer; that is, to him who ſo delivers them; ſometimes to the uſe of him to whom they are delivered; and ſometimes to a third perſon.

BAILIFF, an officer appointed for the adminiſtration of juſtice within a certain diſtrict, called a bailiwick.

BAILIFFS *Errant*, ſuch as are appointed by the ſheriff to go up and down the county, to ſerve writs and warrants, ſummon county-courts, ſeſſions, aſſizes, and the like.

BAILIFFS *of Franchiſes*, thoſe appointed by every lord within his liberty, to do ſuch offices therein, as the bailiff errant does at large in the county.

There are alſo bailiffs of foreſts, and bailiffs of manors, who direct huſbandry, fell trees, gather rents, pay quit-rents, &c.

BAILIWICK, that liberty which is exempted from the ſheriff of the county, over which liberty the lord thereof appoints his own bailiff, with the like power within his precinct, as an under-ſheriff exerciſes under the ſheriff of the county: or it ſignifies the precinct of a bailiff, or the place within which his juriſdiction is terminated.

BAIOCAO, a copper coin, current at Rome, and throughout the whole ſtate of the church, ten of which make a julio, and an hundred a Roman crown.

BAIRAM, in the Mahometan cuſtoms, a yearly feſtival of the Turks, which they keep after the faſt of Ramazan.

The Mahometans have two bairams, the great and the little.

The little bairam holds for three days, and is ſeventy days after the firſt, which follows immediately the Ramazan. During the bairam the people leave their work for three days, make preſents to one another, and ſpend the time with great manifeſtations of joy. If the day after Ramazan ſhould prove ſo cloudy as to prevent the ſight of the new moon, the bairam is put off to the next day, when it is kept, even if the moon ſhould ſtill be obſcured. When they celebrate this feaſt, after numerous ceremonies, or rather ſtrange mimicries, in their moſque, it is concluded with a ſolemn prayer againſt the infidels, to extirpate Chriſtian princes, or to arm them againſt one another, that they may have an opportunity to extend the borders of their law.

BAIT, among fiſhermen, implies a ſubſtance proper to be faſtened to a hook, in order to catch the different ſorts of fiſh.

Baits are of two ſorts. 1. The natural ones, or thoſe generally living, as maggots, bobs, frogs, &c. 2. Of the ſecond kind are all artificial baits, whether ſuch as imitate the living baits, or paſtes of ſeveral compoſitions and figures.

Sheep's blood and cheeſe are good baits in April; the bobs dried, waſps, and bees, are for May; brown flies for June; maggots and hornets for July; ſnails in Auguſt; graſshoppers in September; corn and bramble berries at the fall of the leaf: the red-earth worm is good for ſmall fiſh all the year round; and ſmall fiſh are good baits for pikes at all times.

There are ſeveral artificial baits for intoxicating of fowls, and yet without tainting or hurting their fleſh: for the greater ſort of land-fowls, the bait may be made thus: Take a peck, or a leſſer quantity, of wheat, rye, &c. with which mix two handfuls of nux vomica; boil them together till they are almoſt ready to burſt; ſtrew them upon the land where you deſign to take the fowl, and ſuch as eat thereof will be intoxicated, and lie as if dead. Small birds may be taken with only this alteration; inſtead of wheat, or the like grain, take hemp-ſeed, &c.

BAKER's *Central rule* for the conſtruction of all equations not exceeding four dimenſions, without any previous deduction of them, or firſt taking away their ſecond term, by means of a given parabola and circle.

BAKING, the art of preparing bread, or of reducing meal of any kind, whether ſimple or compound, into bread. See BREAD, BISCUIT, &c.

BAKING *of Porcelain*, or *China Ware*. See CHINA *Ware*.

BALANCE, or BALLANCE, in mechanics, is one of the ſix ſimple powers chiefly uſed in diſtinguiſhing the equality or difference of weights in ponderous bodies, and likewiſe from hence the bulks, or quantities of matter. The balance is of two kinds, ancient and modern.

The *Ancient*, Roman, ſtatera Romana, or ſteel-yard, conſiſts of a beam, as A B (Plate XVII. *fig.* 1.) moveable on a center C, ſuſpended near one of its extremities; the two arms C B, and C A, are kept in equilibrio by the ball B, and hooks, or other apparatus fixed on C B, to which the bodies to be weighed are applied, according to the apparatus fixed on the ſaid arm C B for that purpoſe. On the arm C A is a moveable weight, as W, which ſhews by the ſcale, graduated on C A, the weight of the body applied to the arm C B. This balance, or ſteel-yard, is ſtill uſed by ſome; but it is not ſo exact in weighing heavy bodies as the

Modern BALANCE, now generally uſed, which conſiſts of a beam, or lever, ſuſpended exactly in the middle by the trutina, having ſcales or baſons hung to each extremity. This balance is repreſented by Plate XVII. *fig.* 2. where A B is called the jugum or beam, and the two parts on each ſide the center C, the arms or brachia. The line on which the beam turns, or which divides it into two equal parts, is called the axis, and when conſidered with regard to the length of the brachia, is only eſteemed a point, and called the center of the balance; and that ſlender part which ſhews the ſcale's preponderating, (or what is called the turn of the ſcale) is called the tongue.

A balance is ſaid to be in equilibrio, when the action of the weights upon each brachium to move the balance are equal; ſo that they mutually deſtroy each other. Unequal weights can equiponderate; for if the diſtances from the center be reciprocally as the weights, the balances will be in equilibrio; as for inſtance, one ounce at nine inches diſtance from the center will equiponderate with three ounces at three inches diſtance from the center; and upon this principle the Roman ſteel-yard is conſtructed. In the Roman balance the weight uſed for a counterpoiſe is always the ſame, but the points of application are different or various, but the contrary in the modern balance; for in it the counterpoiſe is various, and the point of application the ſame. The principle on which both are founded, may be eaſily underſtood from the general properties of the lever. See LEVER.

The *Deceitful* BALANCE is ſuch whoſe beam will hang in equilibrio without the ſcales, or with the empty ſcales, and yet ſhall alſo be in equilibrio when unequal weights are put in the ſcales. Theſe kind of balances are conſtructed upon the ſame principle as the ſtatera, or ſteel-yard, and may be made ſo as to cheat in any proportion. Dr. Deſagulieres in Lecture 3, Problem 27th, conſtructed one in the following manner:

To the beam A B *fig.* 3. (which is 23 inches long, whoſe brachium C B of 11 inches in length, keeps in equilibrio about the point C, the brachium C A of 12 inches in length, by being made ſo much thicker, or having ſo much the more matter as may make amends for its being ſhorter,) ſuſpend the ſcales D, E, in ſuch manner that D, which weighs one part in 12 leſs than E, ſhall hang at the longeſt end of the beam, and they will keep each other in equilibrio; then placing 12 pound weight at G in the ſcale E, it will keep in equilibrio no more than 11 pounds of F, the commodity to be ſold, if placed in the ſcale D; becauſe then F will be to G, in a reciprocal proportion of B C to A C——Tho' ſuch a balance may be ſo nicely made as to deceive the eye; yet the cheat is immediately diſcovered by changing the weights and the commodity F from one ſcale to the other; for then the owner of the ſcales muſt either confeſs the fraud, or add to the commodity he ſells, not only what was wanting, but alſo as much as he intended to cheat the buyer of, and a fraction of

that

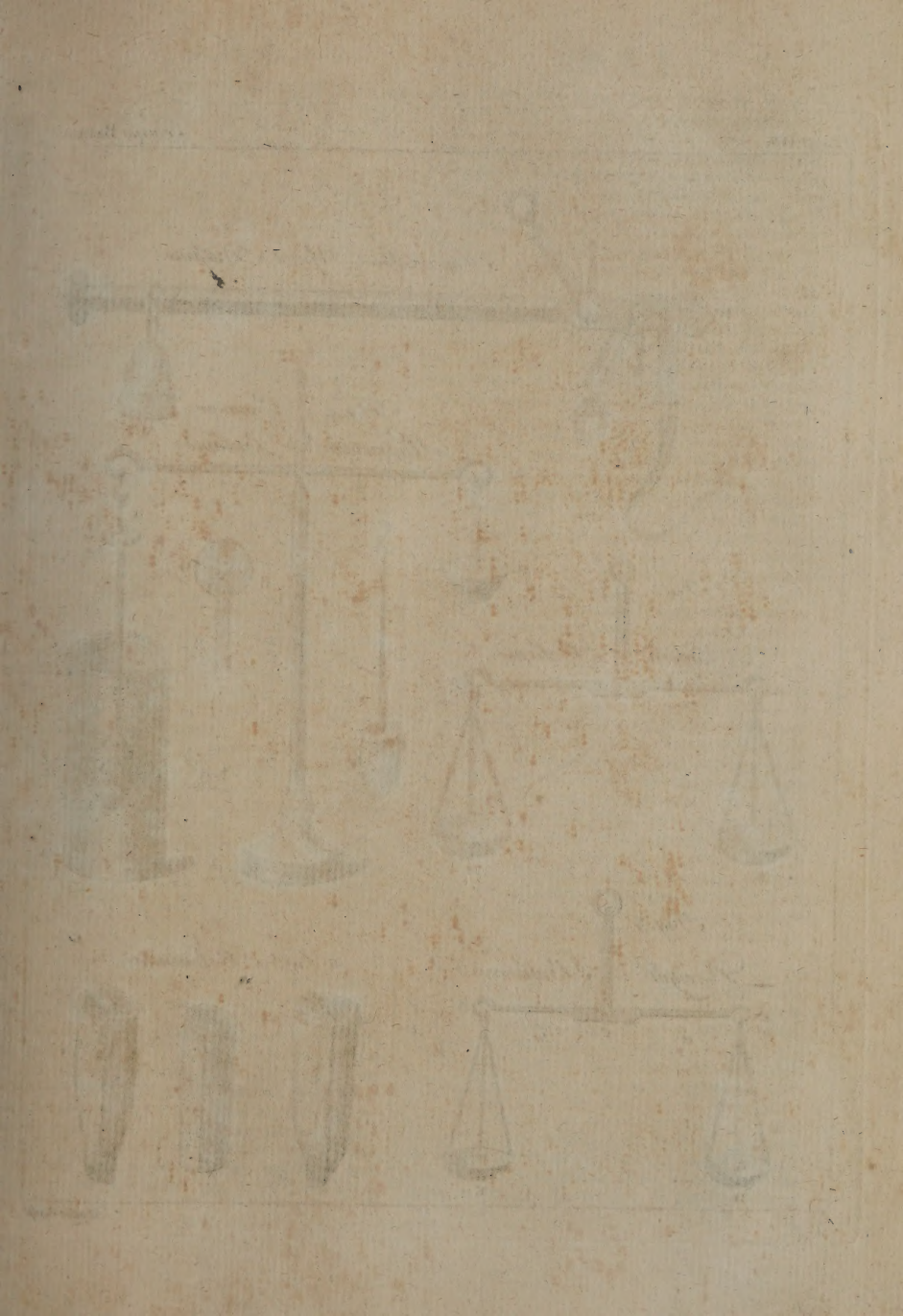


Fig.1. Steel Yard Balance
B
C
A
W
Fig.4. Common Hydrostatic Balance
B
C
D
A
Fig.2. Modern Balance
A
B
C
E
D
Fig.3. Deceitful Balance
A
B
C
G
F
D
E
Fig.5. Belemnitae

that added weight proportionable to the inequality of the brachia of the balance. That is, in this caſe the buyer, inſtead of 11 pounds offered him for 12 his due, will have by changing ſcales $13\frac{1}{11}$ pounds.

For whereas in the firſt poſition of the balance, F×AC was equal to G×BC, when G is placed in the ſcale D, then 12×12 will be equal to no leſs than CB (11) × by $13\frac{1}{11}$ G.

As the brachium CB 11 inches long:
Is to the brachium CA 12 inches long: :
So will F, or the weight 12 placed in the ſcale D:
To G = $13\frac{1}{11}$, or the weight of the commodity keeping the ſcales in equilibrio.

And therefore as this analogy gives a reciprocal proportion between the weights and their velocities, the momenta will be equal, which, with contrary directions, deſtroy one another: but we muſt remark, that in theſe caſes the weights are ſuppoſed to hang freely from thoſe ends of the balance to which they are faſtened. Tho' in the common uſe of the balance the counterpoiſing weights or the ſcales generally hang freely; yet there are ſome caſes where they do not; and in compound engines, where the balances are often a part of a complex machine, inſtead of weights, powers are applied to their ends in all manner of directions, and then they become levers of the firſt kind; ſuch as the regulators in water-engines, beams to blow bellows, &c.

Aſſay BALANCE, a very nice balance uſed in docimaſtical operations, to determine exactly the weight of the minute bodies.

This balance ſhould be made of the beſt ſteel, and of the hardeſt kind; becauſe that metal is not ſo eaſily ſpoiled with ruſt, as iron; and it is more apt than any other to take a perfect poliſh, which at the ſame time prevents the ruſt.

The ſtructure of the aſſayer's ſcale is little different from that of common ſcales, otherwiſe than by its nicety and ſmallneſs. The longer the beam of it is, the more exact may the weight of a body be found: however, ten or twelve inches are a ſufficient length. Let the thickneſs of it be ſo little, that two drachms may hardly be hung at either of its extremities, without its bending: for the largeſt weight put upon it ſeldom exceeds one drachm. The whole ſurface of this beam muſt be altogether without ornaments, which only increaſe the weight, and gather duſt, &c. The beam is ſuſpended in a fork, the two legs of which are ſteel-ſprings joined at top, but kept together below with a braſs pliant claſp, parallel, and two lines and an half diſtant from each other. This claſp being taken off, and the legs of the fork being ſtretched out, the axis of the beam may be put into two holes for that purpoſe at the ends of the legs, or be taken away from them. Let a very ſharp needle be fixed in the head of the fork, ſtanding perpendicularly downwards, if the fork is ſuſpended, and ſo long, as that it may almoſt touch the top of the tongue of the beam, put into the fork, when in equilibrio. This needle is the mark of the equilibrium; and, that the artiſts may be able to obſerve this, the legs of the fork muſt be broader in that place, and have an opening two or three lines wide; this fork may be adorned at pleaſure, provided the motion of the balance is not hindered by ſuch ornaments: then take two ſcales made of a thin plate of ſilver, one inch and an half in diameter, hanging on three ſmall ſilk ſtrings, almoſt as long as the beam, tied together at top, with a ſilver hook, in form of an S, and hang them to the extremities of the beam: a ſmaller ſilver diſh, or blued ſteel, ſomewhat leſs than one inch in diameter, belongs to each of theſe ſcales. You firſt put into theſe diſhes, with a pair of pincers, the bodies to be weighed, or with a ſpoon or a ſmall ſhovel, when they are pounded, and then you put them into ſcales; therefore the ſmall diſhes muſt be perfectly equal in weight. We uſe them, that bodies may be more conveniently put into and taken out of the ſcales, and that theſe, which are vaſtly thin, may not be bent or ſoiled, and thence rendered falſe by wiping.

This balance is ſuſpended on a moveable braſs or copper ſupport, which conſiſts of a pedeſtal, and of a column ſet upon it about twenty inches high, at the top of which comes out at right-angles an arm one inch long. At the extremity of this arm, put a ſmall pulley three lines in diameter, another at the top of the column, and a third near the bottom of it; all which pullies muſt turn very eaſily on their axes. At the diſtance of one inch and a half below the upper arm, let another arm, one inch and a half long, come out of the column at right-angles, having a hole through it two lines long, a quarter of a line broad, and placed perpendicularly below the pulley of the upper arm, to receive a ſmall plate, one inch and a half long; and of ſuch breadth and thickneſs, as that it may move freely up and down, and yet not have too much play within the hole. This plate muſt alſo have a ſmall hook at the extremity.

And as ſuch a balance will hardly ſtand ſtill in the open air, and becomes falſe when ſpoiled with duſt; it muſt be put together with its ſupport into a ſmall glaſs-caſe, having glaſſes at top and all round it, that you may ſee what is within.

Manner of uſing the Aſſay BALANCE.—Paſs a ſilk ſtring over the three pullies of the ſupport, and tie it at its upper extremity to the ſmall hook introduced into the hole of the inferior arm; then put the ſupport in the middle of the ſmall caſe, and paſs the other extremity of the ſilk ſtring below, through a hole bored in the middle of the lower part of the frame, containing the window in the fore-part of

the caſe, and faſten it to a ſmall weight of a cubic form. Suſpend the fork of the balance on the inferior hook of the plate. By this means, if you move backwards and forwards the weight faſtened to the ſtring, placed upon the top of the drawer jutting out beyond the fore-part of the caſe, the balance within is either lifted up, or let down. But you muſt put the bodies to be weighed, and the weights themſelves, in the ſmall ſilver diſhes; and theſe, when loaded, into the ſcales, through the ſide-windows, which muſt be opened for that purpoſe. When any thing is to be added to, or taken out of them, you do it with the ſmall pincers, or, if it is powder, with the ſmall ſhovel or ſpoon: but you muſt let the balance down every time any thing is to be added or taken away, that the ſcales may reſt upon the bottom of the caſe; and ſhut the windows before the balance is lifted up again, eſpecially if the air is not perfectly calm.

Hydroſtatical BALANCE, an inſtrument firſt invented for determining the ſpecific gravity of bodies, both liquid and ſolid, in an accurate, eaſy, and expeditious manner.

Several methods have been propoſed, and more may be ſtill invented, to determine what proportion bodies differ from one another as to their ſpecific gravities; yet after all, moſt men with good reaſon prefer the uſe of the hydroſtatical balance for exactneſs and conveniency.

It is very probable that Archimedes was the firſt that ever attempted this buſineſs, in which the balance is employed, with any ſucceſs, in order to diſcover the cheat of the workmen that had debaſed king Hiero's crown; yet the way he then made uſe of was certainly much inferior to what is now practiſed, by the invention of, and great improvements in, this machine.

It is of great uſe in eſtimating the degree of purity of bodies of all kinds, the quality and richneſs of metals, minerals, ores, &c. as well as the proportion, mixture, adulteration, or the like, all of which the ſpecific weight is the only judge.

The common hydroſtatical balance, as repreſented by Plate XVII. *fig.* 4. needs very little explanation, it being ſo very ſimple. It has commonly a lump of ſolid glaſs in form of a heart, and ſometimes in ſhape of a wedge, the more eaſily to cleave and ſeparate the parts of thoſe fluids in which it ſhall be occaſionally immerſed. Now this being made of a matter not liable to be injured by any liquor, and of weight ſufficient to ſink it in moſt, is convenient for the purpoſe, and is repreſented as in uſe by A. The machine has a fixed counterpoiſe for the other end of the beam, as B, which, when the glaſs is poiſed in rain or river-water, will keep the balance-beam juſt level, whether it be put at the top, middle, or bottom of the jar.

Now all ſuch liquors as are ſpecifically heavier, that is, more buoyant than common water, will require weight to be added on the ſide of the immerſed glaſs A, to reſtore the equilibrium: and ſuch as are leſs ſo, or lighter than common water, will require weight to be added to the counterpoiſe, to bring the beam, which ought to be ſingularly good and true, to a horizontal poſition.

In comparing of two liquors, in order to find ſimply which of them is the heavier, 'tis of no great concern to know what the bulk or ſolid content of the glaſs bubble A is, becauſe the grains on either ſide added, to bring the beam again to a level, will ſufficiently determine how much a quantity of them, equal to the bulk of the bubble, differs from rain or river-water, to which the machine is commonly adjuſted; which is ſomething more of ſatisfaction than from the hydrometer can be had. But how much the denſity of the one exceeds that of the other, or generally in what proportion, cannot be known 'till the weight of the glaſs bubble A, both in air and water, and conſequently the weight of a quantity of the fluid under conſideration in bulk equal thereto, with which it is generally compared, be firſt adjuſted and found.

It may here be remarked, that the beam of the hydroſtatical balance cannot well be too light, if it be but equal to its office without yielding or ſpringing. The way to prove whether it be true or not, is, when you have found any exact equilibrium by it, to change both weight and ſcales together, end for end; and then, if no alteration appears, it is perfectly well executed; otherwiſe not.

A ſquare piece of paper, weighing but one grain, may without difficulty be divided by meaſure into two and thirty parts of a grain; and if you deſire your beam ſhould be affected by the weight of a few of theſe, the reſt of your apparatus muſt be very light alſo; leſt the weight laid on the point of ſupport, ſhould make it too ſluggiſh to move ſo free and finely as it properly ought to do.

Suppoſe then the weight of our eſſay-bubble A, when taken in the water, is one hundred and eighty-two, and in the air two hundred and ſix grains; the difference, or twenty-four grains, is the juſt weight of a quantity of water equal in bulk and dimenſions thereto: which being known, may be received as a general ſtandard whereby to eſtimate the ſpecific gravity of liquors by this machine. For example; warm a jar of water pretty well, it will be thereby rarefied, and rendered ſpecifically more light, and of conſequence the bubble, before adjuſted to that liquor cold, will, on immerſing, ſink therein. And by adding weight on the other ſide, we may eaſily learn how much it is thereby become ſpecifically lighter than a like quantity of water cold; viz. merely by deducting the weight found on experiment neceſſary to reſtore the equilibrium, let us ſuppoſe three grains from

from twenty-four; so that the specific gravity of the cold water will be found to be to that of the hot, as 24 to 21, or 8 to 7.

For experiment's sake, a second trial may be made the same way, on a fluid denser than common water; as suppose strong ash-lees, replete with a lixivial salt, in which case we are to add the difference found on the immersion of the essay-bubble, suppose four grains to twenty-four; the specific gravity hereof will then be signified by the number 28, and an equal quantity of lees will be to common cold water, as 28 to 24, or 7 to 6; and to an equal quantity of the water before warmed, as 28 to 21, or 4 to 3; and thus of any other.

The specific weight of equal quantities of different liquors might indeed be also found, by filling a small phial, of known dimensions and capacity, with them successively; which ought to be first exactly tared or counterpoised on the opposite side. Their several weights then taken by a nice pair of scales, and noted down, may afterwards be compared together tolerably well.

In like manner might also the specific gravities of solid bodies heavier than water be found, was it practicable to reduce them by any means to some certain or determinate dimensions, as to the size of a cubic inch, or the like: but that being not only laborious, and expensive, and tedious, but also very inconvenient and much less exact; the beauty of the hydrostatic balance will therefore appear in assigning their comparative gravities, be their figures never so various or irregular, with very great truth, ease, and expedition.

For the weighing of solids specifically heavier, or which sink in water, hydrostatically, this instrument is provided with a small glass bucket, marked C, which in the air is exactly counterpoised by B; and in water, by adding the small weight D on the bucket-side at E, to counterbalance the buoyancy of the water on the bucket immersed. By this machine fragments of such bodies may be weighed indifferently either in water or the air; both which, in these experiments, are always carefully to be distinctly done; noting their several weights. *Clare's Motion of Fluids.*

As the learned Mr. Gravesande has greatly improved the common hydrostatic balance, and rendered it more accurate and expeditious, we shall give the reader a description of it, according to the improvements of this ingenious author.

The figure of this machine (Plate XVI. *fig.* 6.) represents the balance in its hydrostatic use. We shall first describe the machine; then shew the new contrived artifice for exactness; and, lastly, give an instance of its universal use. V C G is the stand or pillar fixed in the table. From the top at A hangs, by two silken strings, the horizontal piece or bar B B; from which is suspended, by a ring at *i*, the fine beam of a balance *l*, which is kept from descending too low on either side, by the gentle springing piece *z x y x*, fixed on the supporter M. The harness is annulated at *o*, to shew distinctly the perpendicular positions of the examen, by the small pointed index fixed above it. The strings by which the balance is suspended passing over two pullies, one on each side the piece at A, go down to the bottom on the other side, and are hung over the hook, by means of a screw P, which is moveable about $\frac{1}{4}$th of an inch backwards and forwards; and therefore the balance may be raised or depressed as much: but if a greater elevation or depression be required, the sliding-piece S, which carries the screw P, is readily moved to any part of the square brass rod V K, and fixed by means of a screw.

The motion of the balance being thus provided for, the rest of the apparatus is as follows: H H is a small table fixed upon a piece D, under the scales *d* and *e*, and is moveable up and down in a long slit in the pillar above C, and fastened at any part with a screw behind. At the point at the middle of the bottom of each scale, is hung by a fine hook, a brass wire *a d*, *a c*. These pass through two holes *m*, *m*, in the table; and to the wire *a d* is suspended a curious cylindric wire *r s*, perforated at each end for that purpose. This wire *r s* is covered with paper graduated by equal divisions, and is about five inches long. In the corner of the table at E, is fixed a brass tube, in which a round wire *b l* is so adapted as to move neither too hard nor too freely by its flat head I: upon the lower part of this moves another tube Q, which has friction enough to cause it to remain in any position required; to this is fixed an index T, moving horizontally when the wire *b l* is turned about, and therefore may be easily set to the graduated wire *r s*.

To the lower end of the wire *r s* hangs a weight L, and to that a wire *p r*, with a small brass ball *g*, about $\frac{1}{4}$th of an inch in diameter. On the other side, to the wire *a c*, hangs a large glass bubble R to a horse-hair. Let us, at present, suppose the weight L taken away, and the wire *p n* suspended from S; and, on the other side, let the bubble R be taken away, and the weight F suspended in its room at *c*. This weight F, we suppose to be such as will keep in equilibrio with the several parts appended to the other scale, at the same time that the middle point of the wire *p n* is in the surface of the water in the vessel N.

The wire *p n* is to be of such a size, that the length of one inch shall weigh four grains. Hence it is evident, since brass is eight times heavier than water, that for every inch the wire sinks in the water, it will become half a grain lighter; and half a grain heavier for every inch it rises out of the water: consequently, by sinking two inches below the middle point, or rising two inches above

above it, the wire will become one grain lighter or heavier.

And therefore, when the middle point is at the ſurface of the water in equilibrio, the index T be ſet to the middle point *a* of the graduated wire *r s*, and the diſtance on each ſide *a r* and *a s* contain 100 equal parts; then, when in weighing bodies the weight is deſired to the hundredth part of a grain, it may eaſily be had by proceeding in the following manner.

Let the body to be weighed be placed in the ſcale *d*, and put the weights in the ſcale; and let theſe be ſo determined, that one grain more ſhall be too much, and one grain leſs too little. Then the balance being gently moved up or down by the ſcrew P, till the equilibrium be nicely ſhewn at *o*; and then, if the index T be at the middle point *a* of the wire *r s*, it ſhews the weights put into the ſcale *e* are juſt equal to the weight of the body.

But if the index T ſtand at any part between *a* and *r*, it ſhews the number of grains of the ſcale *e* were more than equal to the weight of the body in the ſcale *d*; becauſe the wire *p n* is now made lighter by ſinking below the middle point. Thus, ſuppoſe the weights put into the ſcale *e* were 1095 grains, and the index T cuts the 36th diviſion above *a*, it ſhews that 36 hundredth parts of a grain are to be added, or that the weight of the body is 1095,36 grains.

On the other hand, had the index ſtood at 36, the diviſion below *a*, it would have ſhewn the weights in the ſcale *e* were more than equal to the weight of the body by 36 hundredths of a grain, and that then the weight of the body was 1094,64 grains. By this method we find the abſolute weight of the body; the relative weight is found by weighing it hydroſtatically in water, as follows: Inſtead of putting the body in the ſcale *d*, as before, let it be appended with the weight F at the hook *e*, by a horſe-hair as at R, ſuppoſing the veſſel of water O were taken away; then the equilibrium being made, the index T ſtanding between *a* and *r*, at the 36th diviſion, ſhews the weight of the body 1095,36 grains. As it thus hangs, let it be immerſed in the water of the veſſel O, and it will become lighter by much; the ſcale *e* will deſcend till the beam of the balance reſts on the ſupporter z. Then ſuppoſe 100 grains, put into the ſcale *d*, reſtored the equilibrium preciſely, ſo that the index T again pointed to the 36th diviſion above *a*; it is plain the weight of an equal bulk of water would, in this caſe, be exactly 100 grains. But if 100 grains in the ſcale *d*, cauſe it to preponderate a little, then, by turning the ſcrew P, the balance may be raiſed, till the wire *p n* becoming heavier, reſtores the equilibrio. Let now the index T cut the 6th diviſion above *a*; then 36 − 6 = 30, which ſhews that the wire *p n* is now $\frac{30}{100}$ of a grain heavier than before; therefore the weight of the water is only 99,7 grains; whence its gravity to that of the body is as 99,7 to 1095,36, as required.

After a like manner may this balance be applied to find the ſpecific gravities of fluids, which will not be difficult to thoſe who apprehend what has been already ſaid.

In practice, it will be neceſſary to uſe great precautions in every particular; the wire *p n* ſhould be oiled, and then wiped as clean as poſſible; enough will remain to prevent the water adhering thereto: alſo the balance ought to be raiſed very gently, and when come to an equilibrium, ſhould be gently agitated, to ſee if it will come ſo again.

BALANCING, in the marine, a certain manner of contracting or reducing a ſail in a ſtorm, in contradiſtinction to reefing, which is common to all the principal ſails, whereas balancing is peculiar to the mizen, and to mainſails that are ſet on a boom. Balancing the mizen is performed by gathering a certain portion of the ſail together at the peek or upper-corner, faſtening it to the mizen-yard, at ſome diſtance within the yard-end. A boom-mainſail is balanced, after all the reefs are taken in, by tying a ſimilar portion of the outmoſt or aftmoſt lower-corner, called the clew, in the ſame manner to the bottom, having firſt wrapped a piece of canvas round it, which is done in both caſes, to prevent the ſail from being fretted by the cord which faſtens it. See REEF.

BALANI MARINI, certain multivalve ſhells, uſually growing in cluſters on the ſhells of the larger ſort of the ſea ſhell-fiſh: ſometimes they are found large, looſe, and petrified, at a great diſtance from the ſea; in which ſtate they are diſtinguiſhed by the name of balanitæ.

BALASS, or BALLASS, the name of a kind of ruby. See the article RUBY.

BALAUSTINE, large roſe-like flowers, of a deep red colour, ſet in long bell-ſhaped tough cups. They are the produce of the wild or double-flowered pomegranate tree, a low prickly tree or ſhrub, with long narrow leaves, bearing a browniſh acerb fruit, about the ſize of an orange; a native of the ſouthern parts of Europe; and cultivated in ſome of our gardens on account of the beauty and continuance of its flowers. The ſhops are uſually ſupplied with the dried flowers from abroad, tho' thoſe of our own growth do not appear to be anywiſe inferior to the foreign.

Balauſtine flowers are mildly aſtringent and corroborant; of a moderately rough and ſomewhat bitteriſh taſte, and of little or no ſmell or particular flavour. They give out their aſtringent matter, together with a pale red colour, both to water and rectified ſpirit: the extracts obtained by in-

ſpiſſating

ſpiſſating the tinctures, in which the active parts of the flower are concentrated, are pretty ſtrongly ſtyptic.

BALCONY, in architecture, a projecture in the front of a houſe, or other building, ſupported by pillars, or conſoles, and encompaſſed with a baluſtrade: or it is a kind of open gallery, for people to ſtand in, to behold any public ſhow, or for taking the air in. They are uſually level with the firſt floor, and are made of wood, or iron.

BALDACHIN, of BALDAQUIN, in architecture, a building in form of a canopy, ſupported by pillars, and frequently uſed as a covering to inſulated altars. Some alſo uſe the term baldachin for the ſhell over a door.

BALE, in commerce, is ſaid of merchandizes packed up in cloth, and corded round very tight, in order to keep them from breaking, or preſerve them from the weather.

BALE-GOODS, among the Engliſh merchants, are all ſuch as are imported or exported in bales; but the French give that name to certain hardwares, and other ſort of merchandize, which come to Paris, and are commonly made by bad workmen of indifferent materials.

BALISTA, a machine uſed by the ancients for ſhooting darts; it reſembled in ſome meaſure our croſs-bow.

BALIVO AMOVENDO, in law, was a writ for removing a bailiff from his office, for want of having ſufficient land in his bailiwick to anſwer the king and his people, according to the ſtatute of Weſtminſter, 2 reg. Orig. 78.

BALK, among builders, is ſometimes uſed for the ſummer-beam of a houſe; ſometimes for the poles and rafters which ſupport the roofs of barns, &c. and ſometimes for the beams uſed in making ſea-holds.

BALL, a ſpherical and round body, either naturally ſo, or turned into that form. There are balls of common wood, of box, of iron, &c.

BALL, in the military and pyrotechnical arts, is a compoſition of divers ingredients, generally of the combuſtible kinds, ſerving to burn, ſmoak, give light, &c.

Bomb BALLS are made in the ſame manner as grenadoes; a bomb is firſt put at the bottom of a bag, then a bed or layer of three bombs, and a bed or layer of powder are laid in alternately. Theſe bombs are ſix inches in diameter, and two or three layers of them are contained in a ball.

Fire BALLS, in military affairs, are either round or oval, filled with different compoſitions, all difficult to be extinguiſhed. Theſe are thrown to a great diſtance by a mortar, and ſome of a ſmaller ſize are thrown by hand like grenadoes. Their uſe is to give a light by which an enemy may be diſcovered in the dark, and fired upon with more certainty: they are alſo uſed to fire magazines of forage, and houſes in a town which is attacked. And to prevent any one from coming near them and attempting to extinguiſh the fire, they are filled in the ſame manner as carcaſes with grenadoes, and ſmall ends of muſket-barrels, charged with bullets, which keep thoſe at a diſtance, who might otherwiſe throw ſomething on this fire-work to prevent its effect. See CARCASE, GRENADOE, MORTAR.

Grenado BALLS, in military affairs, are ſacks made of a very coarſe dry cloth. They are filled by putting in firſt about two pounds of powder at the bottom of the bag, with a grenado; this firſt layer, or bed, is covered with four grenadoes, the intervals between them are then filled up with powder, and they are covered with a layer of powder, as the former; upon which, four other grenadoes are laid, in the ſame manner as the firſt. Four different layers of powder and grenadoes are thus diſpoſed alternately, which ought to fill the bag, leaving only ſufficient room to tie it up at the mouth, into which a fuſe is inſerted, and ſtrongly bound up with it; after which, the whole is firſt dipped into pitch or tar, and put into another ſack, which is firſt dipped, as the former, into pitch or tar, and then into water, to prevent it from ſticking to the places where they are kept for uſe: the fuſes of the grenadoes contained in this bag, are covered with *etoupelles*, which is a kind of match conſiſting of the fineſt cotton, well ſoaked in brandy, and priming, or pounded powder, the fire of which inſtantly communicates itſelf to all parts; and by this means, the grenadoes are more certainly fired than if covered with powder only.

Pebble BALLS, are made in the ſame manner as grenado and bomb balls; but in theſe, inſtead of grenadoes and bombs, pebbles are made uſe of; and theſe balls are contrived ſo as to burſt in the air, that the pebbles they are filled with may fall like hail upon the places deſigned.

Light BALLS, *globi lucentes*, are ſuch as diffuſe an intenſe light around; or they are balls which, being caſt out of a mortar, or the hand, burn for ſome time, and illuminate the adjacent parts.

Smoak or Dark BALLS, thoſe which fill the air with ſmoak, and thus darken a place to prevent diſcoveries.

BALL *of a Pendulum*, the weight at the bottom. In ſhorter pendulums, this is called the bob.

BALL, among the Corniſh miners, ſignifies a tin-mine.

BALL, among printers, a kind of wooden tunnel ſtuffed with wool, contained in a leather cover, which is nailed to the wood, with which the ink is applied on the forms to be wrought off.

Horſe BALLS, among farriers, a kind of cordial medicine, adminiſtered in the form of balls, ſuppoſed of great virtue for feeding and ſtrengthen-

ing ſound, as well as healing and raiſing unſound horſes.

Chewing BALLS are thoſe which the horſe keeps champing or maſticating in his mouth, a conſiderable time, without ſwallowing. Theſe are chiefly uſed for a loſt appetite, a thing very incidental to horſes.

They are uſually made of aſa-fœtida, liver of antimony, juniper, bay-wood, and pellitory of Spain, beaten and incorporated into a maſs with verjuice. The method of adminiſtration is to wrap one of the balls in a linen cloth, and, having a ſtring faſtened to it, make the horſe chew it three or four hours at a time. *Ruſt Dict.*

BALL *Vein*, in mineralogy, a name given by the miners of Suſſex to a ſort of iron ore, common there, and wrought to conſiderable advantage.

BALL and SOCKET is an inſtrument made of braſs, with a perpetual ſcrew, to hold a teleſcope, quadrant, or ſurveying inſtrument, on a ſtaff, for various uſes.

BALLAD, or BALLET, a ſpecies of ſong, adapted to the lower claſs of people.

BALLANCE, or BALANCE, in mechanics; ſee BALANCE.

BALLANCE *of Trade*. See TRADE.

BALLANCE *of a Clock or Watch*. See the articles CLOCK and WATCH.

BALLAST, in the marine, a certain quantity of ſtone, iron, gravel, or other materials, depoſited in a ſhip's hold, when ſhe has either no cargo, or too little to ſink her to a ſufficient depth in the water, that ſhe may be enabled to carry ſail without danger of overturning. There is often great difference in the quantity of ballaſt requiſite to prepare ſhips of equal burthen for a voyage; the quantity being always more or leſs in proportion to the ſharpneſs or flatneſs of the bottom, which ſeamen call the floor.

It is very far from being a matter of indifference how a ſhip is ballaſted; for although ſeamen, in general, know very well that few veſſels will carry a ſtout ſail, till they are laden ſo deep, that the ſurface of the water may nearly glance on the extreme breadth amidſhips; yet there is more than this general knowledge required to ballaſt her with propriety; ſince if ſhe has a great quantity of heavy ballaſt, as lead, iron, &c. in her bottom, it will place the center of gravity too low in the hold; and although, by this means, ſhe will be enabled to carry a great ſail; yet ſhe would ſail very badly, and be in danger of being diſmaſted by her ſudden jerks and violent rolling. Seamen commonly endeavour to prevent this, by raiſing the weighty ballaſt with dinnage, *i. e.* boughs of trees, faggots, or ſuch materials, by which means the center of gravity being more elevated, the ſhip will roll eaſily, and ſail ſmoothly through the water. On the other hand, if ſhe be too light, ſhe will incline till her extreme breadth reſts upon the water, and conſequently want ſufficient ſtability for a freſh wind; whereas, if ſhe is well ballaſted, ſhe will carry a good ſail, incline but little, and ply well to the windward. See GRAVITY, SAILING, TRIM.

BALLIAGE, in commerce, a ſmall duty paid to the city of London by aliens, and even denizens, for certain commodities exported by them.

BALLISTA. See the article BALISTA.

BALLOON, or BALLON, in a general ſenſe, implies any hollow body of a ſpherical form, be its compoſition or uſes what they will.

BALLOON, in chemiſtry, is a large receiver of a round form, and very ſhort neck.

BALLOON, in architecture, ſignifies a round ball or globe, placed on the top of a pillar, &c. by way of crowning.

BALLOON, in pyrotechyny, is a kind of bomb made of paſte board, and played off in fire-works, either in the air or water, in imitation of a real bomb.

BALLOTA, in botany, a genus of plants, the flower of which is monopetalous and cloven, the upper lip being erect and crenated, and the lower obtuſe, and divided into three ſegments. It contains four filaments, two of which incline to the upper-lip: the germen is quadrifid, ſupporting a ſtyle the form of the ſtamina; it is deſtitute of a pericarpium, the cup incloſing four ovated ſeeds.

BALLOTADE, or BALOTADE, in the manege, the leap of a horſe between two pillars, or on a ſtraight line, made with juſtneſs of time, and with the aid of the hand and calves of the legs; and in ſuch a manner, that, when his fore-feet are in the air, he ſhews nothing but the ſhoes of his hinder feet, without yerking out.

BALLS, or BALLETS, in heraldry, make a frequent bearing in coats of arms, though they are never called by thoſe names, but acquire other denominations from their ſeveral colours. Thus, when the colour is or, they are termed *beſants*; when argent, *plates*; when azure, *hurts*; when gules, *torteaux*; when vert, *pomeis*; when ſable, *agreſſes*; when purple, *golpes*; when tanne, *orenges*; and when ſanguine, *guzes*.

BALLUSTER, in architecture, a kind of ſmall pillar uſed in balluſtrades.

BALLUSTRADE, a row or ſeries of balluſters joined by a rail, and fixed on a terrace or the top of a building by way of ſecurity; as alſo to incloſe balconies, altars, fronts, ſtaircaſes, &c.

BALM, or BALSAM; ſee BALSAM.

BALM, or BAUM, in botany; ſee BAUM.

BALNEUM, a term much uſed by chemiſts to ſignify a veſſel filled with ſome matter, as ſand, water, or the like, in which others are placed for performing various operations that require leſs heat than a naked fire.

BALNEUM *Arenoſum*, or *Siccum*, a ſand, or dry heat; a veſſel filled with ſand, aſhes, or filings of ſteel.

BALNEUM *Mariæ*, or *Maris*, a water-bath, or a veſſel filled with water, which is made to boil, and in which the veſſels containing the ingredients are placed.

BALNEUM *Vaporis*, a vapour-bath, or when the veſſel containing the ingredients, on which the proceſs is to be performed, is heated by the vapour ariſing from boiling water.

BALSAM, *Balſamum*, an oily, reſinous, and odorous ſubſtance, flowing either ſpontaneouſly, or by inciſion, from certain plants, of great virtues in the cure of ſeveral diſorders.

BALSAM *of Gilead*, or *of Mecca*, *Opobalſamum*, the moſt precious of all balſams; and commonly called balm of Gilead.

It is the produce of certain trees, which grew formerly in the valley of Jericho; but after the conqueſt of the Holy Land by the Turks, were removed to Grand Cairo, and afterwards to Mecca, where the balſam plantation is ſaid to be now guarded by janizaries, and the reſinous juice collected for the ſultan only.

The precious balſam exſudes in very ſmall quantity, from ſlight inciſions made in the bark: according to Proſper Albinus, it is at firſt white, of a very ſtrong penetrating ſmell, of the turpentine kind, but ſweeter and more fragrant, and of a bitter, acrid, aſtringent taſte. It looks in part turbid and thick, like the oil newly expreſſed from olives; afterwards it grows extremely thin, limpid, and light; its colour changes to a greeniſh, then to a gold yellow, and, by long keeping, to that of honey: it now grows thick like turpentine, and loſes much of its fragrance.

Inferior ſorts of balſam are ſaid to be obtained by boiling the branches in water. When the liquor begins to boil, a thin oil ariſes to the ſurface, and on continuing the coction a groſſer and thicker one.

It is uſed in medicine to open obſtructions of the lungs, and to heal eroſions from acrimony, and the worſt kinds of ulcerations. It is alſo preſcribed in aſthmas, pleuriſies, and whenever expectoration is neceſſary, in internal bruiſes, and to cleanſe the urinary paſſages.

BALSAM *of Tolu* is commonly of a thicker conſiſtence than the foregoing, and more of a browniſh colour. When freſh, it has an exceeding pleaſant ſmell, ſomewhat reſembling that of citrons.

It is ſaid to be the produce of New Spain, and to exſude in very hot weather from inciſions made in the bark of a ſmall tree of the fir kind, called Tolu.

We have no particular deſcription of the tree which produces this balſam. Linnæus has given its generical characters, under the name of *toluifera*; and in theſe it differs greatly from the firs and pines, to which it is commonly reſembled. The balſam is one of the moſt elegant and grateful of the ſubſtances of this claſs, and does not loſe much of its fragrance when by age it grows conſiſtent. It yields very little eſſential oil in diſtillation, but impregnates the diſtilled water ſtrongly with its flavour. By diſſolving in this water, in a gentle warmth, a proper quantity of fine ſugar, we obtain a balſamic ſyrup, greatly ſuperior to that made in the common manner with a decoction of the balſam.

Its virtues are the ſame with that of Gilead, and is given in convulſions, and other diſorders of the breaſt, ſometimes in the form of pills, and ſometimes in electuary; but the beſt form of giving it is in emulſion, diſſolved in the yolk of an egg, and then mixed with water.

BALSAM *of Copaiba*, *Cophahu*, *Copaif*, *Campaif*, *Copalyva*, or *Gamelo*, is obtained from a tree of the ſame name, growing in the Brazils, near Rio de Janeiro.

This balſam is of a pale yellowiſh colour, and thin conſiſtence. It is obſervable, that on mixing this juice with the watery ſpirit of ſal ammoniac, made by quick-lime, a frothing, or effervescence, as it is called, enſues, ſtronger and of longer continuance than that produced by the ſame ſpirit with any other natural balſam: by this mark we may diſtinguiſh the genuine copaiba from the thin reſin of the turpentine or fir-tree, which is frequently mixed with or vended for it. This balſam is at preſent of very common uſe as a medicine.

It is obſervable alſo of this balſam, that on being diſtilled in a retort, it gives over towards the end of the operation, an oil of a fine blue colour, preceded by a limpid, and a yellowiſh or browniſh one. Diſtilled with water, it yields a large quantity of a limpid eſſential oil: from ſixteen ounces I have gained eight.

The copaiba-tree is one of the large foreſt trees of Brazil and ſome other parts of America. Mr. Ray calls it *Arbor balſamifera Brazilienſis fructu monospermo*. The leaves are roundiſh and oval, the flowers pentapetalous, the fruit a pod, containing a kernel like a filberd. The wood is of a deep red colour, and great hardneſs; and hence is employed in ornamental mechanic works, and is ſaid to be uſed alſo in dying. The balſam is extracted by making deep inciſions in the trunk of the tree, in the ſummer heats; if this operation is performed too early, no juice exſudes, in which caſe the wounds are for a time cloſed up. It is ſaid that twelve pounds of balſam iſſue from one tree in a few hours; but that after once bleeding, it never affords any more.

It is more deterſive and more fragrant than common turpentine; paſſes very quickly by urine, and greatly

greatly aſſiſts in cleanſing thoſe paſſages; for which reaſon it is frequently given in gonorrhœas, and all obſtructions and ulcerations of thoſe parts.

BALSAM *of Peru* is obtained from certain trees of Peru and Mexico, differing ſomewhat from one another in appearance, and ſomewhat alſo in the quality of their juices.

The balſam-tree deſcribed, by Piſo, under the name of *cabureiba*, has ſmall leaves like thoſe of the myrtle, and a thick aſh-coloured bark, covered with a very thin red one; under this is lodged a yelloviſh balſam, that impregnates the whole ſubſtance of the bark, which by age becomes more and more fragrant. Hernandez deſcribes this balſam-tree, as having leaves like thoſe of the almond, and a thick bark like cork, from which the balſam flows upon wounding the outer thin rind. Plunkenet mentions a tree of the ſame kind in Virginia, by the name of *Arbor Virginiana, Piſaminis folio, Baccata Benzoinum redolens.*

This balſam is of a thick conſiſtence, like honey; of a dark black colour in the maſs, but when ſpread thin of a clear reddiſh or yelloviſh brown, of an agreeable ſtrong ſmell, ſomewhat approaching to that of a mixture of benzoine and ſtorax, and of a bitteriſh pungent taſte, eaſily inflammable, not in the leaſt miſcible with water, nor rendered turbid or white on being agitated with that fluid. It becomes ſoluble in water, like the other balſams, by the mediation of yolk of eggs, or of ſugar; when diſſolved by the latter, it ſoon ſeparates from the water, whilſt the former keeps it much longer ſuſpended.

In diſtillation with water, it yields a ſmall quantity of a fragrant eſſential oil. Hoffman prepares alſo a grateful ſpirit, by drawing over ſpirit of roſes from a mixture of the balſam with half its weight of ſalt of tartar, divided by moiſt ſand. Diſtilled in a retort with an open fire, it affords a butter like that of benzoine, and oftentimes a conſiderable quantity even of concrete ſaline flowers, ſimilar to thoſe procured from that reſin.

It is of a heating and drying quality, and is frequently uſed externally in the cure of wounds. The perfumers alſo uſe it on account of its agreeable ſmell.

Odoriferous BALSAMS are a fragrant kind of unguents, generally of a thick conſiſtence, compoſed of ſome fatty, denſe juice, joined with ſome diſtilled oils of various kinds.

Boerhaave's method of preparing theſe balſams, is this: Melt an ounce of fine pomatum, in a China veſſel, over a ſmall and perfectly clear fire; then gradually add a dram of white wax, ſhaved into thin pieces: after theſe are perfectly blended together, remove the veſſel from the fire; and when the matter begins to thicken in cooling, drop in, by ſlow degrees, a dram of any of the fragrant eſſential oils; keep the whole continually ſtirring, all the time the oil is dropping in, that it may perfectly mix: after which, ſet the veſſel in cold water, that the whole matter, immediately condenſing by the cold, may keep in the oil and ſpirit. When the balſam is thoroughly cold, put it immediately up in veſſels of lead or pewter; and, if theſe are cloſe covered, it will keep perfect a great many years.

Inſtead of pomatum and wax, the expreſſed oil of nutmeg may be uſed in this proceſs, after it has been waſhed in water, till perfectly inſipid, white, and inodorous.

If theſe balſams are required to be of any colour, it may be eaſily given at pleaſure. A ſcruple of fine cochineal, in fine powder, will tinge the balſam of a fine purple; or the ſame quantity of the inſpiſſated juice of buckthorn berries, to a fine green; a little native cinnabar will turn it ſcarlet: turmeric, yellow; and ſmalt, to a beautiful blue. Any of theſe may be uſed at pleaſure, provided that they have no ill ſmell, or hurtful properties.

Theſe balſams are prepared as rich perfumes, to raiſe the languid ſpirit; and the nobleſt and richeſt of the eſſential oils ſhould therefore be uſed in them. The oils, principally directed by Boerhaave to this purpoſe, are thoſe of balm, calamus aromaticus, cinnamon, cedar, citron, cloves, jaſmin, lavender, white lilies, marjoram, mace, nutmegs, origanum, oranges, both thoſe of China and Seville; roſes, rhodium, and yellow ſaunders; to which may be added, the natural balſams of Peru and Gilead; theſe two being ſpontaneouſly fragrant without diſtillation. *Boerhaave's Chemiſtry.*

BALSAMICS, in pharmacy, ſoftening, reſtoring, healing, and cleanſing medicines, of gentle attenuating principles, very friendly to nature.

Theſe medicines, on account of their fine, ſubtile, and volatile oil, are not only grateful and agreeable to the conſtitution, but act upon the fluids, as well as the ſolids, of human bodies; diffuſing their virtues through every part, and ſupplying the blood and humours with a ſeaſonable reinforcement of ſulphureous, warm, and ethereal parts, increaſing their inteſtine motions, and conveying vigour to the vital juices.

Theſe medicines may be uſed with good ſucceſs, both internally and externally, in all diſeaſes of the head, nerves, ſpinal marrow, ſtomach and heart; ſuch as palſies, apoplexies, numbneſs and torpor of the ſenſes, weakneſs of the memory, difficulty of hearing, exceſſive weakneſs, and faintings; they are alſo of ſingular ſervice in moſt diſorders of the ſtomach and inteſtines, and are exquiſitely adapted to the old and infirm.

BALSAMINA, the female balſam, in botany, the name of a genus of plants, whoſe flowers are of the polypetalous anomalous kind: the flowers come

come out from the joints of the ſtalks upon ſlender foot-ſtalks about an inch long, each ſuſtaining a ſingle flower, which is compoſed of five large unequal petals, which in front are ſhaped like the lip-flowers; at their baſe they have a long tail, which is crooked; theſe are ſucceeded by an unilocular capſule, opening with an elaſtic force in five valves: the ſeeds it contains are fixed to the axis or placenta.

The moſt beautiful and valuable kind are thoſe which produce double flowers, of which there are three ſorts, finely ſtriped with pink, ſcarlet, or purple, ſo as to appear almoſt as beautiful as a carnation, and are much noticed by the curious. Theſe plants are raiſed on hot-beds in the ſpring, and nearly managed as the amaranthus. See AMARANTHUS. As theſe flowers are apt to degenerate, ſo as in a few years to become ſingle; the beſt method to preſerve their plenitude of petals, is by changing ſeeds with ſome perſon who lives at a diſtance, and can be depended upon for his care in the choice of bloſſoms for ſeed; for all ſingle flowers ſhould be plucked off ſo ſoon as they open, likewiſe all double flowers, which are of one colour, reſerving only thoſe which are both double and ſtriped. This genus of plants is called by Linnæus, impatiens.

BALSAMITA, in botany, a ſpecies of tanſey, called alſo coſtmary, a corymbiferous plant, the roots of which are hard, fleſhy, and creep in the ground. Its lower leaves are about the ſize of thoſe of garden-mint, of a yellowiſh green colour, elegantly ſerrated at their edges. The ſtalks riſe from two to three feet high, and ſend out branches from the ſide; they are furniſhed with oval ſawed leaves like thoſe at the bottom, but ſmaller, and ſit cloſe to the ſtalk. The flowers are produced at the top of the ſtalks in a looſe corymbus, are naked, and of a deep yellow colour; they appear in Auguſt, but produce no ſeeds in England; the whole plant has a ſoft pleaſant odour.

It is propagated by parting its roots in autumn. Where theſe plants are cultivated for uſe, they ſhould be planted in beds at about two feet diſtance, that they may have room to grow; for in two years the roots will meet, ſo that every other year they ſhould be tranſplanted and parted, to keep them within compaſs.

In medicine, the leaves chiefly are uſed as a ſtomachic, cephalic, carminative, and deobſtruent; they are alſo externally applied by way of fermentation, or bathing, in order to ſtrengthen the joints, &c.

BAMBOE, or BAMBOW, as they ſpell that word in the Indies, in botany, the name of a plant that multiplies very much by its root, from which ſprings a ramous or branchy tuft, after the manner of the European reeds; of which, as well as the ſugar-cane, it is a ſpecies. The Indian bamboe is the largeſt kind of cane hitherto known. It is of an extraordinary height and bigneſs when it bears its bloſſom; each ſhoot or cane is often at the bottom as large as a man's thigh, and decreaſes gradually to the top, where it bears a bloſſom or flower, like our reeds, in their proper ſeaſon.

The bamboe grows in all the maritime countries of the Eaſt-Indies. Its leaves are like thoſe of the other canes or reeds, but neither ſo long nor ſo broad at their baſe. With theſe bamboes the Indians build their houſes, and make all ſorts of furniture, in a very ingenious manner. The wood is ſo hard and ſtrong, that they ſerve very well to make piles for ſupporting their little houſes, built over rivers, or in plains overflowed at ſome ſeaſons of the year with water. They alſo make with this wood all ſorts of utenſils for their kitchens and tables. The thickeſt bamboes ſerve to make the ſticks or poles with which the ſlaves or other perſons carry thoſe ſorts of litters which are called palanquins, ſo generally uſed in all the Eaſt. They alſo make of that wood a kind of pails, in which the water keeps extremely cool.

BANANA-TREE, in botany, a ſpecies of the muſa, or plantain, growing plentifully in the Weſt and Eaſt-Indies. This plant riſes with a ſoft herbaceous ſtalk, marked with dark purple ſtripes and ſpots, and grows fifteen feet high and upwards: the lower part of the ſtalk is often as large as a man's thigh, diminiſhing gradually to the top, where the leaves come out on every ſide: theſe are often ſix feet long, and above a foot wide. The fruit is ſix or ſeven inches long, and covered, when ripe, with a yellow and tender ſkin. It grows on a ſtalk which bears a bunch or cluſter of bananas; when the bunch is gathered, they cut off the ſtalk, otherwiſe it would bear no more fruit. The pulp of the fruit is very ſoft, and of a pleaſant taſte, and is generally eaten in the hot countries by way of deſert. It is ſaid to be very nouriſhing, to excite urine, and provoke to venery.

BAND, in a general ſenſe, ſome ſmall, narrow ligament, wherewith any thing is bound, tied, or faſtened.

BAND, in architecture, a general name for any flat, low member, or moulding, that is broad, but not very deep.

BAND *of Soldiers*, in military affairs, thoſe who fight under the ſame flag or enſign.

BAND *of Penſioners*, are a company of one hundred and twenty gentlemen, who receive a yearly allowance of one hundred pounds for attending on his majeſty on ſolemn occaſions.

BAND is alſo the denomination of a military order in Spain, inſtituted by Alphonſus XI. king of Caſtile, for the younger ſons of the nobility, who, before their admiſſion, muſt ſerve ten years,

at leaſt, either in the army, or at court; and are bound to take up arms for the catholic faith againſt the infidels.

BAND, in ſurgery; ſee BANDAGE.

BANDAGE, in ſurgery, a fillet, roller, ſwathe, &c. applied to any part of the body.

That bandages are very uſeful, and even neceſſary, for curing the diſorders of the human body, is evident, not only from the teſtimonies of Hippocrates, Galen, and other eminent phyſicians, but alſo from this, that there can ſcarcely be any operation, in ſurgery, performed ſucceſsfully without their aſſiſtance: for ſhould a ſurgeon perform an operation with the greateſt care, but miſcarry in the application of the bandage, all his endeavours would be to no purpoſe; and more eſpecially in the treatment of wounds, fractures, luxations, and amputations: and we often find, that, in fractures and luxations, after a proper reduction of the parts, the cure depends more on a ſkilful application of the bandage to the part affected, than on the medicines: and in the caſe of violent hæmorrhages, a proper application of the bandage and compreſſes proves the moſt effectual and ſpeedy remedy, as muſt be acknowledged by every one who has any ſkill in ſurgery; not to mention that the applying and making a bandage, after a genteel and ready manner, is juſtly reckoned among the good qualifications of a ſurgeon, as it gains him the eſteem of the ſpectators, and the confidence of his patient, which is of great influence in forwarding the cure; for both the one and the other judge of a ſurgeon's other abilities by his performance on ſuch occaſions.

BANDALEER, or BANDELEER, in military affairs, a large leathern belt, thrown over the right ſhoulder, and hanging under the left arm; worn by the ancient muſketeers, both for the ſuſtaining of their fire-arms, and for the carriage of their muſket charges, which being put up in little wooden caſes, coated with leather, were hung, to the number of twelve, to each bandaleer.

BANDELET, or BANDLET, in architecture, any little band, or flat moulding, as that which crowns the Doric architrave.

BANDEROLL, a little flag, in form of a guidon, extended more in length than breadth, uſed to be hung out on the maſts of veſſels, &c.

BANE-BERRIES; ſee ACTÆA.

BANDITTI, a term peculiarly denoting companies of highwaymen, common in Italy and France; but ſometimes alſo uſed, in a more general ſenſe, for robbers, pirates, out-lawed perſons, ruffians, &c.

BANIAN-DAYS, a cant-name given by ſeamen to thoſe days in which they are allowed ſome other ſpecies of proviſion, as peaſe, butter, cheeſe, &c. in the room of fleſh-meat.

BANIANS, a religious ſect in the empire of the Mogul, who believe a metempſychoſis, and will therefore eat no living creature, nor even kill noxious animals; but endeavour to releaſe them when in the hands of others.

The Banians are ſaid to be ſo fearful of having communication with other nations, that they break their cups, if one of a different religion has drank out of them, or even touched them. It is ſaid, that if they happen to touch one another, they purify and waſh themſelves before they eat, or enter their own houſes. They carry, hanging to their necks, a ſtone, called tamberane, as big as an egg, and perforated in the middle, through which run three ſtrings: this ſtone, they ſay, repreſents their great god, and upon that account they have great reſpect ſhewn them by all the Indians.

BANISHMENT, a kind of puniſhment, whereby the guilty perſon is obliged to leave the realm.

There are two kinds of baniſhment; one voluntary, and upon oath; the other upon compulſion, for ſome crime or offence: the former, properly called abjuration, is now ceaſed; the latter is chiefly enjoined by judgment of parliament, or other courts of juſtice.

By Magna Charta, none ſhall be outlawed, or baniſhed his country, but by lawful judgment of his peers, according to the law of the land, 9 Hen. III. 29.

BANISTERIA, in botany, a genus of plants producing papilionaceous flowers, and are natives of ſeveral parts of the Weſt-Indies: one of the ſpecies, which grows naturally in Jamaica, ſends forth a woody ſtalk, which twiſts itſelf round the neighbouring trees, and raiſes itſelf to their tops. It is garniſhed with leaves as large as thoſe of the bay-tree, and of the ſame thickneſs, growing oppoſite in pairs; the flowers are produced in long branching ſpikes at the ends of the branches, and are of a yellow colour, compoſed of five ſmall leaves; theſe are ſucceeded by two or three winged ſeeds, like thoſe of the greater maple, from which circumſtance it has been called by ſome the climbing maple.

BANK, in commerce, a common repoſitory, where many perſons agree to keep their money, to be always ready at their call or direction: or certain ſocieties or communities, who take the charge of other people's money, either to improve it, or to keep it ſecure.

BANK, in hydrography, an elevation of the ground or bottom of the ſea, that is often ſo high as to appear above the ſurface of the water, or at leaſt ſo little below it, as not to permit a veſſel to float over it.

In this ſenſe, bank amounts nearly to the ſame

as ſhallows, flats, &c. The ſhelves that have rocks under water, are diſtinguiſhed by other names, as ridges, reefs, &c.

Banks are uſually marked by a beacon or buoy: on charts, ſand-banks are commonly marked by little dots, and ridges of rocks by croſſes. The principal banks in the Weſtern Ocean are, the banks of Newfoundland, and the Bahama bank: the chief of thoſe at Newfoundland is called the grand bank, which is of a vaſt extent, being nearly two hundred and fifty miles in length, reaching north and ſouth; its uſual depth is from twenty to fifty fathoms; and this is the great ſcene of the cod-fiſhery, which is ſo capital an article in European commerce.

An exact knowledge of the banks, their extent, and the different depths of water on them, conſtitutes a very eſſential portion of the ſcience of a pilot, or maſter of a ſhip. If the veſſel be large, and draw much water, great attention will be neceſſary to avoid the banks; if, on the contrary, it be ſmall, the ſame banks afford a ſure aſylum, where it may brave the largeſt ſhip, that dare not follow it to ſo dangerous a retreat. Many ſmall veſſels have eſcaped the purſuit of their enemy, by means of this hoſpitable barrier.

BANKER, a perſon who trafficks and negotiates in money; who receives and remits money from place to place by commiſſion from correſpondents, or by means of bills or letters of exchange.

Banker, in bricklaying, a piece of timber whereon they cut the bricks.

The banker is ſix feet long, or more, according to the number of men to work at it, and nine or ten inches ſquare: it is to be laid on two piers of timber, three feet high from the floor they ſtand on.

BANKING, the making of banks to oppoſe the force of the ſea, rivers, or the like, and ſecure the land from being overflowed thereby.

With reſpect to the water which is to be kept out, this is called banking; with reſpect to the land, which is thereby to be defended, imbanking.

Banking, in a ſalt work, the raiſing a fence againſt the ſea, whereby its waters may be kept out, excepting ſo much as is neceſſary for the preparation of the ſalt.

BANKRUPT, any perſon, either man or woman, that by trading hath gotten other perſons goods into his or her hands, and concealeth himſelf from his creditors. It is not buying or ſelling of lands, but of perſonal things, that will make a perſon liable to be a bankrupt; nor is it buying only, but both. Every one that gets his livelihood by buying and ſelling in trade, may fall under a ſtate of bankruptcy upon his failing: but adventurers in the Eaſt-India company, members of the bank of England, or of the South-ſea company, ſhall not be adjudged bankrupts, in reſpect of their ſtock: alſo no perſon concerned as receiver-general of the taxes, &c. ſhall be a bankrupt. If a merchant gives over trade, and ſome years after becomes not ſolvent for money owed while a merchant, he is a bankrupt; but if for new debts continued on new ſecurity, it is otherwiſe.

BANKRUPTCY, the failure, abſconding, and relinquiſhing of traffic in a merchant, a banker, or any other trader. See the article Bankrupt.

The French make this difference between a bankruptcy and a failure, that the firſt is ſuppoſed voluntary and fraudulent, and the latter conſtrained and neceſſary, by means of accidents, &c. A failing, breaking, or ſtopping of payment, diminiſhes the merchant's credit; but does not note him with infamy, as bankruptcy does.

When a merchant fails to appear at the Exchange, without apparent reaſon, it is called a failing of preſence: the bankruptcy becomes open from the day he abſconds, or the ſeal is affixed to his effects.

BANN, or Ban, *Bannum*, or *Bannus*, in the feudal law, a ſolemn proclamation or publication of any thing. Hence the cuſtom of aſking, or bans, before marriage.

Bann, in military affairs, a proclamation made in the army by beat of drum, ſound of trumpet, &c. requiring the ſtrict obſervance of diſcipline, either for the declaring a new officer, or puniſhing an offender.

Bann *of the Empire*, an imperial proſcription, being a judicial puniſhment, wherewith ſuch as are acceſſory to diſturbing the public peace, are judged unworthy of the immunities and protection of the empire, and are outlawed or baniſhed, &c.

BANNER denotes either a ſquare flag, or the principal ſtandard belonging to a prince.

We find a multiplicity of opinions concerning the etymology of the word banner; ſome deriving it from the Latin *bannum*, a band or flag; others, again, from the German *ban*, a field or tenement, becauſe landed men alone were allowed a banner; and, finally, there are ſome who think it is a corruption of *panniere*, from *pannus*, cloth, becauſe banners were originally made of cloth.

BANNERET, an ancient order of knights, or feudal lords, who poſſeſſing ſeveral large fees, led their vaſſals to battle under their own flag, when ſummoned thereto by the king.

This order is certainly moſt honourable, as it never was conferred but upon ſome heroic action performed in the field. Anciently there being but two kinds of knights, great and little, the firſt were called bannerets, the ſecond batchelors; the firſt compoſed the upper, and the ſecond the middle nobility.

In

In France they are said to transmit their degree to their posterity: but in England it dies with them. We have had none of this order created in England, since the time of king Charles I. so that this order is now become extinct among us.

The form of the banneret's creation was this; on a day of battle, the candidate presented his flag to the king, or general, who cutting off the train, or skirt thereof, and making it a square, returned it again; the proper banner of bannerets, who, from hence, are sometimes called knights of the square flag.

BANQUET, in the manege, that small part of the branch of a bridle that is under the eye, which being rounded like a small rod, gathers and joins the extremities of the bitt to the branch, and that in such a manner, that the banquet is not seen, but covered by the cope, or that part of the bitt that is next the branch.

BANQUET *Line*, an imaginary line drawn in making a bitt along the banquet, and prolonged up or down to adjust the designed force or weakness of the branch, in order to make it stiff or easy.

BANQUET, or BANQUETTE, in fortification, a little foot bank, or elevation of earth, forming a path, which runs along the inside of a parapet, upon which the musketeers get up in order to discover the counterscarp, or to fire on the enemy in the moat, or in the covert-way.

BANTAM-WORK, a kind of Indian painting, and carving on wood, resembling Japan work, only more gay, and decorated with a great variety of gaudy colours.

BAPTISM, in theology, the ceremony of washing; or a sacrament whereby a person is admitted into the Christian church.

The word is formed from the Greek, βαπτίζω, of βάπτω, to dip, or wash.

In the primitive Christian church, the office of baptising was vested principally in the bishops, and priests, or pastors of the respective parishes: but, with the consent of the bishop, it was allowed to the deacons, and, in cases of necessity, even to laymen, to baptise; but never, under any necessity whatever, was it permitted to women to perform this office. Nor was it enough, that baptism was conferred by a person called to the ministry, unless he was also orthodox in the faith. This became matter of great bustle in the church; and hence arose the famous controversy between Cyprian and Stephen bishop of Rome, concerning the re-baptising those who had been baptised by heretics, Cyprian asserting that they ought to be re-baptised, and Stephen maintaining the contrary opinion.

BAPTISMAL, something belonging to baptism; thus we say, baptismal vow, fonts, presents, &c.

BAPTISTS, in church history, the name by which the anabaptists love to distinguish themselves. See ANABAPTISTS.

BAPTISTERY, the place in which the ceremony of baptism is performed.

BAR, in a general sense, denotes a slender piece of wood or iron for keeping things close together.

BAR, in courts of justice, an inclosure made with a strong partition of timber, where the council are placed to plead causes. It is also applied to the benches where the lawyers or advocates are seated, because anciently there was a bar to separate the pleaders from the attornies, and others. Hence our lawyers who are called to the bar, or licensed to plead, are termed barristers, an appellation equivalent to licentiate in other countries.

BAR, in law, a plea of a defendant which is said to be sufficient to destroy the plaintiff's action.

BAR, in heraldry, an ordinary resembling the fess, but much smaller.

It differs from the fess only in its narrowness. The fess is also confined to a single place, whereas the bar may be placed in any part of the shield.

BAR, in horsemanship, implies the highest part of a horse's mouth, between the grinders and tushes, that part only which lies under and at the side of the bars, retaining the name of gum.

BAR, in music, a stroke drawn perpendicularly across the lines of a piece of music, including, between every two bars, a certain quantity, or measure of time, which is different, according as the music is either triple or common. In the former the measure of three crotchets is included, in the latter four. The principal use of bars is to regulate the beating of time.

BAR, in hydrography, a shoal, or bank of sand, gravel, &c. situated at the mouth of a river or harbour, which frequently endangers, and sometimes totally prevents the navigation.

BARS *of a Capstan*; see the article CAPSTAN.

BAR-MASTER, among miners, the person who keeps the dish, or gage, for measuring the ores.

BAR-SHOT. See SHOT.

BARACKS. See BARRACKS.

BARALIPTON, among logicians, the first indirect mode of the first figure of a syllogism.

When the two propositions are general, and the third particular, the middle term being the subject in the first proposition, and the predicate in the second, the syllogism is said to be in baralipton. The following is of this kind:

B A. Every evil ought to be feared;
R A. Every violent passion is an evil;
LIP. Therefore something that ought to be feared is a violent passion.

BARALOTTS, *Baralotti*, a ſect of heretics at Bologna in Italy, among whom all things, even their wives and children, were in common. They were alſo called *obedients*, or compliers, becauſe they readily complied with every thing that tended to promote debauchery.

BARBA *Jovis*, Jupiter's beard, in botany, (or the ſilver-buſh, ſo called from the whiteneſs of its leaves) is a ſhrub which often grows ten or twelve feet high, and divides into many lateral branches, which are furniſhed with winged leaves, compoſed of an equal number of narrow lobes, which are very white and hairy. The flowers, which are papilionaceous, are produced at the extremity of the branches, collected into ſmall heads, of a bright yellow colour, and appear in June; theſe are ſucceeded by ſhort woolly pods, containing two or three kidney-ſhaped ſeeds. This plant is increaſed by ſeeds or cuttings; but being ſomewhat tender, it requires ſhelter in winter in this climate.

BARBACAN, or BARBICAN, properly ſignifies the outer wall, or exterior defence of a city or fortreſs.

BARBACAN alſo implies a fort at the entrance of a bridge, or in the out-let of a city, having a double wall with towers.

It likewiſe denotes an aperture made in the walls of a fortreſs, to fire through upon the enemy.

BARBACAN, in architecture, is a canal or opening left in the wall, in order to give room for the water to run in and out, when buildings are erected in places liable to be overflowed, &c.

BARBADOES-TAR, *Petroleum Barbadenſe*, in the materia medica, a fluid bitumen, or mineral oil, of a reddiſh colour, and thick conſiſtence, approaching to that of treacle, or common tar. It is found in ſeveral of our American dominions, eſpecially in that iſland from which it receives its name.

This bitumen is greatly eſteemed by the Americans as a ſudorific, and frequently given in diſorders of the breaſt. It is alſo uſed as an external diſcutient and antiparalytic.

BARBARA, in logic, is a name given by the ſchoolmen to the firſt mode of the firſt figure of ſyllogiſms.

A ſyllogiſm in barbara is that whoſe propoſitions are all univerſal and affirmative; the middle term being the ſubject of the firſt propoſition, and the attribute in the ſecond: as,

BAR. Every wicked man is miſerable;
BA. All tyrants are wicked men;
RA. Therefore all tyrants are miſerable.

BARBARISM, in grammar, an offence againſt the purity of ſtyle or language; or a hard and coarſe expreſſion, never uſed by polite authors.

BARBE, a name uſually given to a Barbary horſe, greatly eſteemed for its beauty and ſwiftneſs.

BARBE, in the military art, is a term applied to the firing of cannon. Thus, to fire in barbe, is to fire the cannon over the parapet, inſtead of firing through the embraſures. The parapet muſt not be above three feet and a half high, otherwiſe it will be impoſſible to fire in this manner.

BARBE, among our anceſtors, ſignified the armour of a knight's horſe.

BARBEL, *Barbus*, the name of a river fiſh, and ſo called from its having a barb or beard under its noſe.

BARBERY, in botany; ſee BERBERIS.

BARBLES, or BARBS, in farriery, are ſmall excreſcences under the tongue, and which may be diſcovered by drawing it aſide, and cured by cutting them cloſe off, and waſhing the part with brandy, or ſalt and water.

BARCALAO, a ſpecies of cod reſembling that of Newfoundland, caught in ſeveral parts of the South-ſea, particularly on the coaſt of the iſland of Juan Fernandes.

BARCA-LONGA, a ſmall coaſting veſſel, navigated on the coaſt of Spain: it is equipped with two, and ſometimes three pole-maſts, *i. e.* maſts that have no top-maſt or upper-part, and long ſquare ſails, called lug-ſails.

BARD, a poet among the ancient Gauls and Britons, who ſung the praiſes of heroes, in order to recommend virtue, and compoſe the diſſenſions among mankind.

BARDANA, in botany. See ARCTIUM.

BARDESANITES, in eccleſiaſtical hiſtory, a ſect of heretics in the ſecond century, the followers of Bardeſanes, a native of Edeſſa, in Meſopotamia.

They held the devil to be a ſelf-exiſtent independant Being; and taught that Chriſt was not born of a woman, but brought his body with him from heaven; maintained that God himſelf was ſubject to fate; and that virtue and vice depended on the influence of the ſtars.

BARGAIN, in commerce, a contract or agreement in buying and ſelling.

BARGAIN *and Sale*, in law, is properly a contract, made of manors, lands, and other things, transferring the property thereof from the bargainer to the bargainee, for a conſideration in money.

BARGE, in the marine, a veſſel or boat of ſtate, curiouſly decorated, furniſhed with elegant apartments, canopies, and cuſhions, equipped with a band of rowers, and adorned with flags and ſtreamers: they are generally uſed for proceſſions on the water by noblemen, officers of ſtate, or magiſtrates of great cities. Of this kind we may with great probability ſuppoſe the famous barge or

galley of Cleopatra, ſo elegantly painted by Shakeſpeare, which, as it is ſo cloſely connected with our ſubject, that is, ſo beautifully illuſtrated by it, we ſhall partly inſert:

The barge ſhe ſat in, like a burniſhed throne,
Burnt on the water; the poop was beaten gold,
Purple her ſails, and ſo perfum'd, that
The winds were love-ſick with 'em; the oars were ſilver,
Which to the tune of flutes kept ſtroke, and made
The water which they beat, to follow faſter,
As amorous of their ſtrokes . . . .

. . . . . on each ſide her
Stood pretty dimpled boys, like ſmiling Cupids,
With divers-colour'd fans, whoſe wind did ſeem
To glow the delicate cheeks which they did cool,
And what they undid, did . . . . .

. . . . . At the helm
A ſeeming mermaid ſteer'd: the ſilken tackles
Swell'd with the touches of thoſe flower-ſoft hands
That yarely fram'd their office. From the barge
A ſtrange inviſible perfume hit the ſenſe
Of the adjacent wharfs.

There are likewiſe other barges of a ſmaller kind and a lighter frame, for admirals and captains of ſhips of war, calculated to be eaſily hoiſted into and out of the ſhips to which they may belong.

BARGES are alſo large flat-bottomed veſſels of burthen, for lading and diſcharging ſhips, and removing their cargoes in a harbour. See LIGHTER, PRAME, KEEL.

BARGE-COUPLES, in architecture, a beam mortiſed into another, to ſtrengthen the building.

BARGE-COURSE, with bricklayers, implies that part of the tiling which projects over without the principal rafters, in all ſorts of buildings where there is either a gabel-end, or a kirkin-head.

BARILLA, a ſpecies of pot-aſh, ſometimes called ſoda, and prepared in Spain from a plant called kali. See KALI.

BARING *of Trees*, in agriculture. See ABLAQUEATION.

BARK, *Cortex*, the exterior part of trees, ſerving them for a ſkin or covering. There are two barks belonging to every tree, the outward one, called *cortex*, and the inward one, called *liber*; which latter, being placed between the outward bark and the wood, comes neareſt to the nature of the wood, and in time paſſes into it, by a ſucceſſive mutation of the *cortex* into *liber*, and the *liber* into wood. The outward bark is generally of a ſpongy texture, and communicates with the pith by a multiplicity of ſmall fibres, paſſing through the capillary tubes of which the wood conſiſts; ſo that the roots having imbibed the proper nouriſhment of the tree, it is carried up by the warmth of the ſun, through the fine arterial veſſels of the tree, to the top of it, and being there condenſed by the cold, it does, by its own gravity, return down by the veſſels which lie between the wood and the inner bark, which perform the office of veins, and as it paſſes by, leaves ſuch parts of its juice as the texture of the bark will receive, and requires for its ſupport.

The bark ſerves for divers purpoſes; for it not only tranſmits the nutritious juices of the plants, but alſo contains divers fat oily humours, to defend the inner parts from the injuries of the weather. As animals are furniſhed with a *panniculus adipoſus*, uſually replete with fat, which inveſts and covers all the fleſhy parts, and ſcreens them from external cold; ſo are plants encompaſſed with a bark replete with fat juices, by means whereof the cold is kept out, and in winter time, the ſpiculæ of ice prevented from fixing and freezing the juices in their veſſels; whence it is, that ſome ſort of trees remain ever-green throughout the year, by reaſon their barks are more compact, and contain a larger quantity of oil than can be ſpent and exhaled by the ſun. The antients wrote their books on bark, eſpecially of the aſh or lime-tree, not on the exterior, but on the inner and finer bark.

There are many kinds of barks in uſe in ſeveral arts; as the oak-bark for tanning leather, which when it has done that office, is fit for uſe in hot-houſes, &c. and alſo for firing. Some barks are uſed in medicine, as the jeſuit's-bark, mace, &c. and others for divers purpoſes, as the bark of the cork-tree: in the Eaſt-Indies, they ſpin the bark of a certain tree into a ſtuff; they likewiſe mix it with ſilk in manufacturing of ſtuffs which go under different denominations.

Jeſuits BARK. See the article QUINQUINA.

BARK, in the marine, a general name given to ſmall ſhips: it is however peculiarly appropriated to thoſe that carry three maſts and no mizen-top-ſail. Our northern ſeamen who navigate the colliers, give this diſtinction to a broad-ſterned ſhip which carries no ornamental figure on the ſtern, or prow.

BARKING *of Trees*, the peeling off the rind or bark.

It is neceſſary in our climate, to perform this operation in the month of May; becauſe in that month the bark will more readily ſeparate from the wood, than at any other time of the year.

BARLEY, *Hordeum*, in botany, a gramineous, frumentaceous plant, whoſe ſeeds are of the larger ſort, covered with a huſk growing in a ſpike, and the grains bearded. Barley, properly dried into malt and ground, makes a principal ingredient in that well known liquor called beer and ale, for which purpoſe it is greatly propagated in England.

The

The culture of barley is to ſow the ſeed in the ſpring of the year; if the land is light and dry, the beginning of March is the proper ſeaſon; but in ſtrong clayey ſoils, it ſhould not be ſown till April, and ſometimes not till the beginning of May; but when it is ſown ſo late, it requires a favourable autumn to get it well in. Some ſow barley upon land where wheat grew the former year; but when this is practiſed, the ground ſhould be ploughed the beginning of October, in a dry time, laying it in ſmall ridges, that the froſt may mellow it the better, and this will much improve the land; and if it is ploughed again in January or February, it will ſtill be more advantageous: in March the ground ſhould be ploughed again and laid flat, where it is not very wet; but in ſtrong wet lands the ground ſhould be laid rounding, and the furrows made deep to receive the water. When this is finiſhed, the common method is to ſow the ſeed with a broad caſt, at two ſowings; the firſt being harrowed in once, and the ſecond harrowed until the ſeed is buried. The common allowance of ſeed is four buſhels to an acre: this is the quantity of grain uſually ſown by the farmers; but if they could be prevailed on to alter this practice, they would ſoon find their account in it, for if leſs than half that quantity were ſown, there would be a greater produce, and the corn leſs liable to lodge (which has been proved by experience); for when corn, or any other vegetables, ſtand very cloſe to each other, the ſtalks are drawn up very weak, and are therefore incapable to reſiſt the force of the winds, or bear up under heavy rains; but when they are at a proper diſtance, their ſtalks will be more than twice the ſize of the others, and conſequently muſt ſupport themſelves with more ſtrength; for the natural growth of corn is to ſend out many ſtalks from a root, and not riſe ſo much in height, therefore it is entirely owing to the roots ſtanding too near each other, that the ſtalks are drawn up tall and weak. When barley is ſown, the ground ſhould be rolled after the firſt ſhower of rain, to break the clods and lay the earth ſmooth, which will render it better to mow, and cauſe the earth to lie cloſer to the roots, which will be of great ſervice to it in dry weather. Where barley is to be ſown upon new broken-up land, the uſual method is to plough it up in March, and let it lay fallow until June; at which time it ſhould be ploughed again and ſown with turnips, which are eaten by ſheep in winter, by whoſe dung the land is greatly enriched: in March following the ground is ploughed again, and ſown with barley, as before directed. There are many people who ſow clover with their barley, and ſome have ſown lucern; but neither of theſe methods is to be commended, for where there is a good crop of barley, the clover or lucern muſt be ſo weak as not to pay for ſtanding; ſo that the better way is, to ſow barley without any other crop among it, for when the barley is taken off the ground, the land will be at liberty to receive any other crop.

The practice of ſowing clover, rye-graſs, and other graſs ſeeds with corn, has been ſo long and univerſally eſtabliſhed among farmers, that there is little hopes of prevailing with thoſe people to alter a cuſtom which has been handed down to them from their predeceſſors, although there may be many examples produced to ſhew the abſurdity of this practice.

When barley has been up three weeks or a month, it is not amiſs to roll it over with a weighty roller, which will preſs the earth cloſe to the roots, and thereby prevent the ſun and air from penetrating the ground, which will be of ſingular ſervice in dry ſeaſons, particularly where the land is light; and this rolling of it before it ſtalks, will cauſe the roots to produce a greater number of ſtems; ſo that if the plants ſhould be thin, this operation will make them ſpread ſo as to fill the ground, and likewiſe ſtrengthen the ſtalks.

Barley is fit to cut when the red colour of the ears is off, the ſtalks turn yellow, and the ears begin to hang down. In the north of England they always reap their barley, and make it up in ſheaves, as is practiſed for wheat, by which method it becomes more handy for ſtacking, and leſs corn is waſted than by the common way of mowing it; but it cannot be ſo well practiſed where there are many weeds among the corn, eſpecially in moiſt ſeaſons; for when it ſo happens, the barley muſt lay in the ſwarth till all the weeds are dead; and if it ſhould be wet weather, it muſt be ſhook up, and turned every dry day after rain, to prevent its ſprouting. When it is carried to be ſtacked, it ſhould be thoroughly dry; for if it be ſtacked wet, it will turn muſty; or if too green, it is ſubject to burn in the mow: to prevent which, the beſt method is to cut a hole from top to bottom in the middle of the mow; or if it is ſuſpected before ſtacking, to lay in the middle ſome truſſes of ſtraw, at the time of building the mow, which can be readily removed if it is likely to fire. The common produce of barley is two and a half, or three quarters on an acre.

Common Engliſh barley is ſeldom or never uſed medicinally: beſides its nutritive virtues, in which it agrees with all other grain of the like kind, it is reckoned to have ſomewhat more abſterſive in it; for which reaſon, thoſe who are not accuſtomed to eat barley bread, (of which it makes the worſt ſort) will find it at firſt to operate with them like a gentle cathartic. It is very probable, that a change from a finer and more nouriſhing bread to this, would in many corpulent conſtitutions be of great ſervice, by reducing their exorbitant bulks, and cleanſing the ſecretory paſſages.

Barley-Corn, the leaſt long-meaſure known in

in England: it is equal to one third of an inch.

BARNABITES, in eccleſiaſtical hiſtory, a religious order founded in the ſixteenth century by three Italian gentlemen, who had been adviſed by a famous preacher of thoſe days, to read carefully the epiſtles of St. Paul; and hence they were ſtiled clerks of St. Paul; but acquired the name of Barnabites, from their performing their firſt exerciſe in the church of St. Barnabas at Milan. Their habit is black, and their duty conſiſts in inſtructing, catechiſing, and ſerving in miſſion.

BARNICLE, or ſoland gooſe, in natural hiſtory, a ſpecies of gooſe with a black beak, which is much ſhorter than that of the common gooſe. It is common in the north of Scotland.

BARNICLE alſo ſignifies a ſpecies of ſhell-fiſh, often found ſticking to the bottoms of ſhips, rocks, &c.

BARNICLES, among farriers, an inſtrument compoſed of two branches, joined at one of the extremities with a hinge. It is put upon the noſe of a horſe, when he will not otherwiſe ſtand quiet to be ſhod, blooded, or dreſſed.

BAROCO, in logic, implies the fourth mode of the ſecond figure of ſyllogiſms.

A ſyllogiſm in baroco has the firſt propoſition univerſal and affirmative; but the ſecond and third, particular and negative; while the middle term is the predicate in the two firſt propoſitions. The following is of this kind:

B A. Every virtue is attended with diſcretion:
R O. Some kinds of zeal are not attended with diſcretion;
C O. Therefore ſome kinds of zeal are not virtues.

BAROMETER, an inſtrument with which we find the weight and variations of the atmoſphere, in order to determine the changes of the weather.

In the beginning of the laſt century, it was a prevailing opinion among philoſophers, that the univerſe was full of matter; and that Nature (as they expreſſed it) abhorred a vacuum: accordingly they imagined, that if a fluid was ſucked up a pipe with a ſufficient force, it would riſe to any height whatever; ſince Nature would not ſuffer any part of the pipe to remain empty. Galilæo, who flouriſhed about that time, found upon trial, that the common pump would not raiſe water, unleſs the ſucker reached within three and thirty feet of its ſurface in the well: from hence he judiciouſly inferred, that a column of water thirty-three feet high was a counterpoiſe to a column of air of an equal baſe, whoſe height extended to the top of the atmoſphere; and that, for this reaſon, the water would not follow the ſucker any farther. Torricelli, obſerving this, took the hint; and conſidered, that if a column of water of about thirty-three feet, was equal in weight to a column of air of the ſame baſe; a column of mercury, no longer than about twenty-nine inches and a half, would be ſo too; ſuch a column of mercury being as heavy as thirty-three feet of water. Accordingly he tried the experiment in a glaſs-tube, and found it to ſucceed. The apparatus he made uſe of is now the common barometer, or weather-glaſs.

The mercury ſtanding at a leſs height, the nearer it is carried to the top of the atmoſphere, renders it uſeful in determining the height of mountains, and finding out the different elevation of one place above another. Accordingly, Dr. Halley has given a table for that purpoſe, in the Philoſophical Tranſactions, N°. 181, ſhewing how many feet the deſcent of the mercury each inch anſwers to, as it is conveyed to the top of a mountain, or other elevated place. And Dr. Nettleton has done the like in the Philoſophical Tranſactions, N°. 388, ſhewing what number of feet anſwers to each tenth part of an inch, from twenty-ſix to thirty-one inches of mercury.

But the principal uſe of it is, to eſtimate the gravity of the air at different times, in order to foreſee the alterations of the weather, which are conſequent thereon. To this end, Dr. Halley in the ſame tranſaction has alſo laid down the more remarkable phænomena, relating to the different heights of the mercury at different times, together with the ſolution of each; which are ſo juſt, and ſo agreeable to true philoſophy, that we doubt not but the reader will excuſe us for giving his account in his own words, rather than to render it imperfect, by endeavouring to vary from it, or abridge it.

"1. In calm weather, when the air is inclined to "rain, the mercury is commonly low.

"2. In ſerene, good, ſettled weather, the mer- "cury is generally high.

"3. Upon very great winds, though they be "not accompanied with rain, the mercury ſinks "loweſt of all, with relation to the point of the "compaſs the wind blows upon.

"4. Ceteris paribus, the greateſt heights of the "mercury are found upon eaſterly and north-eaſ- "terly winds.

"5. In calm froſty weather, the mercury ge- "nerally ſtands high.

"6. After very great ſtorms of wind, when "the mercury has been low, it generally riſes again "very faſt.

"7. The more northerly places have greater "alterations of the barometer, than the more ſou- "therly.

"8. Within the tropics, and near them, thoſe "accounts we have had from others, and my own "obſervations at St. Helena, make very little or

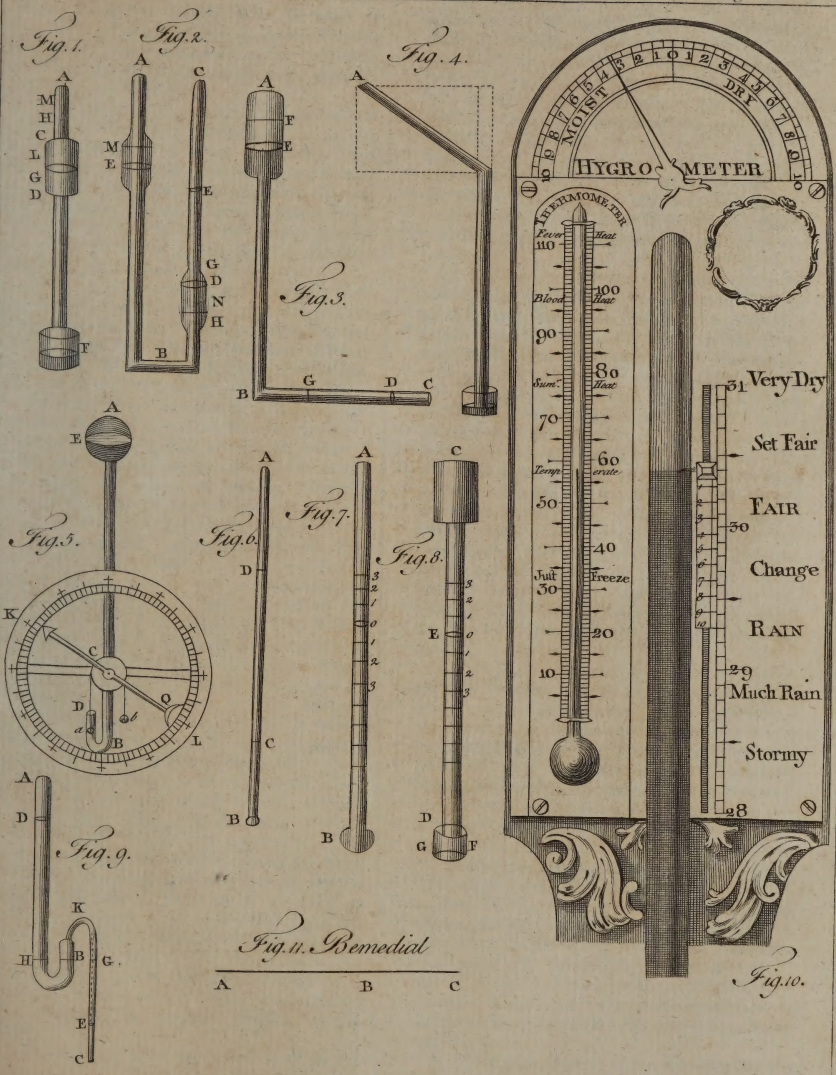
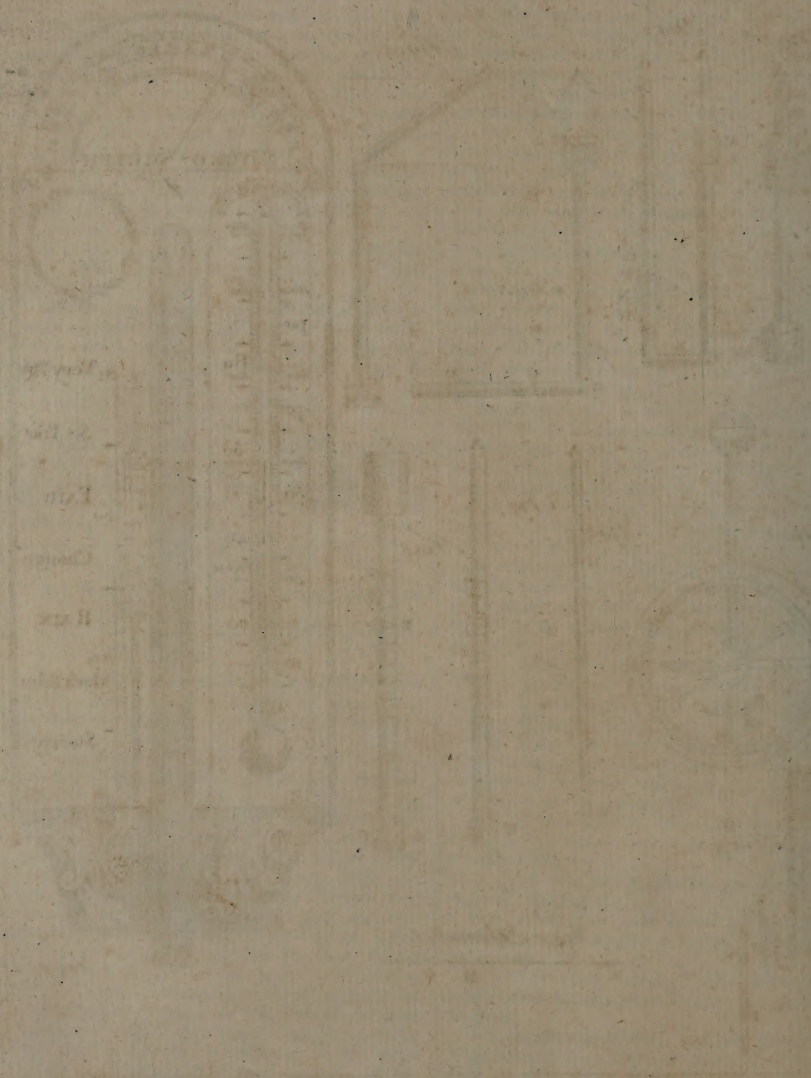


Fig. 1.
Fig. 2.
Fig. 3.
Fig. 4.
Fig. 5.
Fig. 6.
Fig. 7.
Fig. 8.
Fig. 9.
Fig. 10.
Fig. 11. Bemedial
A
B
C
HYGRO METER
MOIST
DRY
HYGROMETER
Very Dry
Set Fair
FAIR
Change
RAIN
Much Rain
Stormy



" no variation of the height of the mercury in all " weathers.

" Hence I conceive that the principal cauſe of " the riſe and fall of the mercury, is from the va- " riable winds, which are found in the temperate " zone, and whoſe great inconſtancy, here in " England, is moſt notorious.

" A ſecond cauſe is the uncertain exhalation and " precipitation of the vapours lodging in the air, " whereby it comes to be at one time much more " crouded than at another, and conſequently hea- " vier, but this latter in a great meaſure depends " upon the former. Now, from theſe principles, I " ſhall endeavour to explicate the ſeveral phæno- " mena of the barometer, taking them in the ſame " order I laid them down. Thus:

" 1. The mercury's being low, inclines it to " rain, becauſe the air being light, the vapours " are no longer ſupported thereby, being become " ſpecifically heavier than the medium wherein " they floated, ſo that they deſcend towards the " earth, and in their fall, meeting with other aque- " ous particles, they incorporate together, and " form little drops of rain; but the mercury's be- " ing at one time lower than at another, is the ef- " fect of two contrary winds blowing from the " place where the barometer ſtands, whereby " the air of that place is carried both ways from " it, and, conſequently, the incumbent cylinder " of air is diminiſhed, and accordingly the mer- " cury ſinks: as for inſtance, if in the German " ocean it ſhould blow a gale of weſterly wind, " and at the ſame time an eaſterly wind in the " Iriſh ſea; or if in France it ſhould blow a nor- " therly wind, and in Scotland a ſoutherly; it " muſt be granted, that that part of the atmo- " ſphere impendent over England, would thereby " be exhauſted and attenuated, and the mercury " would ſubſide, and the vapours, which before " floated in thoſe parts of the air of equal gravity " with themſelves, would ſink to the earth.

" 2. The greater height of the barometer is oc- " caſioned by two contrary winds blowing towards " the place of obſervation, whereby the air of other " places is brought thither and accumulated; ſo " that the incumbent cylinder of air, being increaſed " both in height and weight, the mercury preſſed " thereby muſt needs ſtand high, as long as " the winds continue ſo to blow; and then the " air being ſpecifically heavier, the vapours are " better kept ſuſpended, ſo that they have no in- " clination to precipitate and fall down in drops, " which is the reaſon of the ſerene good weather " which attends the greater heights of the " mercury.

" 3. The mercury ſinks the loweſt of all by the " very rapid motion of the air in ſtorms of wind. " For the tract or region of the earth's ſurface, " wherein the winds rage, not extending all " round the globe, that ſtagnant air which is left " behind, as likewiſe that on the ſides, cannot " come in ſo faſt as to ſupply the evacuation " made by ſo ſwift a current, ſo that the air muſt " neceſſarily be attenuated, when and where the " ſaid winds continue to blow, and that more or " leſs, according to their violence; add to which, " that the horizontal motion of the air being ſo " quick as it is, may, in all probability, take off " ſome part of the perpendicular preſſure thereof; " and the great agitation of its particles is the rea- " ſon why the vapours are diſſipated, and do not " condenſe into drops, ſo as to form rain, other- " wiſe the natural conſequence of the air's rare- " faction.

" 4. The mercury ſtands the higheſt upon the " eaſterly and north-eaſterly wind, becauſe in the " great Atlantic ocean, on this ſide the thirty-fifth " degree of north latitude, the winds are almoſt al- " ways weſterly or ſouth-weſterly; ſo that when- " ever here the winds come up at eaſt and north- " eaſt, 'tis ſure to be checked by a contrary gale " as ſoon as it reaches the ocean; wherefore, ac- " cording to what is made out in our ſecond re- " mark, the air muſt needs be heaped over this " iſland, and conſequently the mercury muſt ſtand " high, as often as theſe winds blow. This holds " true in this country, but is not a general rule for " others, where the winds are under different cir- " cumſtances; and I have ſometimes ſeen the " mercury here as low as twenty-nine inches " upon an eaſterly wind, but then it blew ex- " ceeding hard, and ſo comes to be accounted " for, by what was obſerved upon the third re- " mark.

" 5. In calm froſty weather the mercury gene- " rally ſtands high, becauſe (as I conceive) it ſel- " dom freezes, but when the winds come out of " the northern or north-eaſtern quarters; or, at " leaſt, unleſs thoſe winds blow at no great diſ- " tance off: for the north parts of Germany, " Denmark, Sweden, Norway, and all that tract " from whence the north-eaſtern winds come, are " ſubject to almoſt continual froſt all the winter; " and thereby the lower air is very much condenſ- " ed, and in that ſtate is brought thitherwards by " thoſe winds, and being accumulated by the op- " poſition of the weſterly wind blowing in the " Ocean, the mercury muſt needs be preſſed to a " more than ordinary height; and, as a concur- " ring cauſe, the ſhrinking of the lower parts of " the air into leſſer room by cold, muſt needs cauſe " a deſcent of the upper parts of the atmoſphere, to " reduce the cavity made by this contraction to an " equilibrium.

" 6. After great ſtorms, when the mercury has " been very low, it generally riſes again very faſt: " I once obſerved it to riſe one inch and an half " in leſs than ſix hours, after a long-continued

" ſtorm of ſouth-weſt wind. The reaſon is, be-
" cauſe the air being very much rarefied, by the
" great evacuations which ſuch continued ſtorms
" make thereof, the neighbouring air runs in the
" more ſwiftly, to bring it to an equilibrium; as
" we ſee water runs the faſter for having a greater
" declivity.

" 7. The variations are greater in the more
" northerly places, as at Stockholm, greater than
" that at Paris (comparsd by M. Paſchal;) be-
" cauſe the more northerly parts have uſually
" greater ſtorms of wind than the more ſoutherly,
" whereby the mercury ſhould ſink lower in that
" extreme; and then the northerly winds bringing
" the more denſe and ponderous air from the
" neighbourhood of the Pole, and that again be-
" ing checked by a ſoutherly wind at no great dif-
" tance, and ſo heaped, muſt of neceſſity make
" the mercury in ſuch caſe ſtand higher in the
" other extreme.

" 8. Laſtly, this remark, That there is little or
" no variation near the equinoctial, does above all
" others confirm the hypotheſis of the variable
" winds being the cauſe of theſe variations of
" the height of the mercury; for in the places
" above-named there is always an eaſy gale of wind
" blowing nearly upon the ſame point, viz. eaſt-
" north-eaſt, at Barbadoes, and eaſt-ſouth-eaſt at
" St. Helena, ſo that there being no contrary cur-
" rents of air to exhauſt or accumulate it, the at-
" moſphere continues much in the ſame ſtate:
" however, upon hurricanes (the moſt violent of
" ſtorms) the mercury has been obſerved very low,
" but this is but once in two or three years,
" and it ſoon recovers its ſettled ſtate, about
" 29 ½ inches."

Monſieur Leibnitz accounted for the deſcent of the mercury before rain, upon another principle, viz. as a body ſpecifically lighter than a fluid, while it is ſuſpended by it, adds more weight to that fluid, than when, by being reduced in its bulk, it becomes ſpecifically heavier, and deſcends; ſo the vapour, after it is reduced into the form of clouds, and deſcends, adds leſs weight to the air than before; and therefore the mercury falls. To which it is anſwered, 1ſt, That when a body deſcends in a fluid, its motion in a very little time becomes uniform, (or nearly ſo) a farther acceleration of it being prevented by the reſiſtance of the fluid; and then, by the third law of nature, it preſſes the fluid, downwards, with a force equal to that whereby it tends to be farther accelerated, that is, with a force equal to its whole weight. 2dly, The mercury, by its deſcent, foretels rain a much longer time before it comes, than the vapour, after it is condenſed into clouds, can be ſuppoſed to take up in falling. 3dly, Suppoſing that as many vapours as fall in rain, during the ſpace of a whole year, were at once to be condenſed into clouds, and even quite ceaſe to gravitate upon the air, its gravity would ſcarce be diminiſhed thereby, ſo much as is equivalent to the deſcent of two inches of mercury in the barometer. Farther, in many places between the tropics, the rains fall at certain ſeaſons, in very great quantities, and yet the barometer ſhews there very little or no alteration in the weight of the air.

The following are Mr. Patrick's obſervations on the riſing and falling of the mercury. They are very juſt, and are to be accounted for on the ſame principles with thoſe of Dr. Halley.

" 1. The riſing of the mercury preſages in ge-
" neral fair weather; and its falling, foul weather;
" as rain, ſnow, high winds, and ſtorms.

" 2. In very hot weather, the falling of the
" mercury foreſhews thunder.

" 3. In winter the riſing preſages froſt; and
" in froſty weather, if the mercury falls three or
" four diviſions, there will certainly follow a thaw.
" But in a continued froſt, if the mercury riſes, it
" will certainly ſnow.

" 4. When foul weather happens ſoon after the
" falling of the mercury, expect but little of it.
" And, on the contrary, expect but little fair
" weather, when it proves fair ſhortly after the
" mercury has riſen.

" 5. In foul weather, when the mercury riſes
" much and high, and ſo continues for two or
" three days before the foul weather is quite over,
" then expect a continuance of fair weather to
" follow.

" 6. In fair weather, when the mercury falls
" much and low, and thus continues for two or
" three days before the rain comes; then ex-
" pect a great deal of wet, and probably high winds.

" 7. The unſettled motion of the mercury de-
" notes uncertain and changeable weather.

" 8. You are not ſo ſtrictly to obſerve the words
" engraven on the plates (though, for the moſt
" part, it will agree with them) as the mercury's
" riſing and falling: for if it ſtands at much rain,
" and then riſes up to changeable, it preſages fair
" weather, although not to continue ſo long, as it
" would have done, if the mercury were higher: and
" ſo, on the contrary, if the mercury ſtood at fair,
" and falls to changeable, it preſages foul wea-
" ther; though not ſo much of it, as if it had ſunk
" down lower."

From theſe obſervations, it appears, that it is not ſo much the height of the mercury in the tube that indicates the weather, as the motion of it up and down; wherefore, in order to paſs a right judgment of what weather is to be expected, we ought to know whether the mercury is actually riſing or falling, to which end, the following rules are of uſe.

1. If the ſurface of the mercury is convex, ſtanding higher in the middle of the tube than at the ſides,

ſides, it is generally a ſign that the mercury is then riſing.

2. If the ſurface is concave, or hollow in the middle, it is ſinking. And,

3. If it is plain, the mercury is ſtationary, or rather, if it is a little convex; for mercury being put into a glaſs tube, eſpecially a ſmall one, will naturally have its ſurface a little convex; becauſe the particles of mercury attract each other more forcibly than they are attracted by glaſs. Farther,

4. If the glaſs is ſmall, ſhake the tube; and if the air is growing heavier, the mercury will riſe about half the tenth of an inch higher than it ſtood before; if it is growing lighter, it will ſink as much. This proceeds from the mercury's ſticking to the ſides of the tube, which prevents the free motion of it, till it is diſengaged by the ſhock. And therefore, when an obſervation is to be made with ſuch a tube, it ought always to be ſhaken firſt, for ſometimes the mercury will not vary of its own accord, till the weather it ought to have indicated, is preſent.

The uſefulneſs of knowing, whether the mercury is actually riſing or falling; and the advantage that would ariſe from perceiving the moſt minute variations in eſtimating the heights of places, have given occaſion to the invention of ſeveral kinds of barometers different from the Torricellian, though founded on the ſame principle; wherein the ſcale of variation, which in that is not above three inches, ſhould be conſiderably larger. Of which we are now to give ſome account.

1. The firſt is that of Des Cartes, which was made in the form repreſented, Plate XVIII. *fig.* 1. where AB is a tube hermetically ſealed at A, and having its lower orifice immerged in ſtagnant mercury E F, and filled with the ſame fluid to G, from thence to H with water, and empty from thence to the top. Now, when the mercury riſes in this tube, ſuppoſe from G to L, the water will be raiſed in the ſmall tube perhaps from H to M, viz. as many times further, as the tube C A is ſmaller than C D; by which means the variations become much more ſenſible, than they are in the common barometer. The inconvenience of this was, that the air, included in the water, getting looſe by degrees, filled the void ſpace at the top, and ſpoiled the machine.

2. He then contrived it thus: ABC, (*fig.* 2.) is a bent tube hermetically ſealed at A, filled with water from F to D (tinged with aqua regia to prevent its freezing,) from D to E with mercury, and empty from thence to the top. Then, upon the mercury's riſing, ſuppoſe from E to M, and falling as much at D, the ſurface of the water at F would ſink ſo many times farther than the ſurface of the mercury at D, as the tube C G was ſmaller than G H. The water here is liable to evaporate, though that may, in ſome meaſure, be prevented, by pouring a few drops of oil of ſweet almonds upon it. Others have contrived

3. The horizontal or rectangular barometer (*fig.* 3.) hermetically ſealed at A, and filled with the mercury from D to E; then as the upper ſurface of it riſes in the tube, ſuppoſe from E to F, the lower will be driven from D to G, as many times farther, as this part of the tube is leſs than that at E. But it often happens, that ſome parts of the mercury break off from the reſt in the leg B C, and are left behind. This inconvenience is remedied in,

4. The diagonal barometer A B C (*fig.* 4.) wherein the mercury, inſtead of riſing from B to D (ſuppoſe that ſpace to correſpond to the ſcale of variation in a ſtrait tube) will riſe from B to A; for it will always ſtand at the ſame perpendicular height, whatever be the inclination of the tube; becauſe fluids preſs only according to their perpendicular altitude. But the tube A B muſt not be too much inclined, leſt the mercury break in it, as in the former.

5. AB (*fig.* 5.) is Dr. Rook's wheel-barometer, wherein A B D is a tube filled with mercury from *a* to E; *a* is an iron ball, ſwimming on the ſurface of the mercury; this as it ſubſides with the ſurface of the mercury, draws the little wheel *m n* round, to whoſe circumference it is fixed by means of the ſtring *a c*: this wheel carries the index P Q, which points to the graduated edge of the circle K L, and by its motion ſhews the moſt minute variations of the mercury. When the ball *a* is raiſed by the mercury on which it ſwims, the index is drawn the contrary way by a leſſer ball *b*, which hangs on the other ſide the wheel. The friction in this machine, unleſs it be made with great accuracy indeed, renders it uſeleſs.

6. The pendent barometer is another contrivance to render the variations more ſenſible. It conſiſts of a ſmall conical tube, (repreſented *fig.* 6.) hermetically ſealed at A, and filled with mercury from C to D, and empty from thence to A. Now, ſuppoſing the gravity of the air encreaſed, it will raiſe the mercury higher in the tube, and ſo force it into a narrower part; by which means the column becoming longer, its perpendicular preſſure upon the air below will be proportionably encreaſed. On the contrary, when the air becomes lighter, the mercury deſcends into a larger part of the tube, and by that means has the length of its column proportionably contracted. The inconvenience that attends this barometer is, that the tube muſt be very ſmall, otherwiſe the mercury will fall out; or the air will be apt to get into it, and divide the column in ſeveral places; and when the tube is very ſmall, the friction of the mercury againſt the ſides of it, will hinder it from riſing and falling freely.

7. Dr.

7. Dr. Hook, obſerving how unfit the common barometer was to be uſed on board of ſhip, by reaſon its poſition ought to be ſteady, contrived the following one, called, from its uſe, a marine barometer, conſiſting of two parts, the one AB (*fig.* 7.) the common ſpirit thermometer, the other CD (*fig.* 8.) a tube filled with air from C to E, and from thence to the end D with tinged water. This end is immerged in the ſame fluid contained in the veſſel GF; and having its ſurface expoſed to the preſſure of the external air. Now, the laſt of theſe machines will be affected both by the warmth of the external air, and alſo by its preſſure: the former dilating the air included in CE, and by that means driving the water downwards; the latter preſſing it up higher in the tube: whereas the other, viz. AB, is affected by the warmth of the air alone. Conſequently, were theſe inſtruments graduated in ſuch a manner, that, if the gravity of the external air ſhould always remain the ſame it was when the inſtruments were made, their variations (then only depending on its warmth) ſhould exactly correſpond with each other; that is, when the ſpirit in the tube AB, ſhould aſcend to 1, the water in CD, ſhould deſcend to 1, &c. Then, whenever their variations ſhould be obſerved to differ from each other, the difference could only be aſcribed to ſome alteration in the preſſure of the air upon the ſurface of the water in the veſſel GF. In proportion therefore as this difference is greater, or leſs, ſo is the alteration in the gravity of the air, from what it was when the inſtruments were adjuſted. For inſtance, when the water ſtands above the diviſion which correſponds to that which the ſpirit points to in the other machine, it is an indication, that the preſſure of the air is greater at that time, than when the inſtruments were graduated, and *vice verſâ*.

This machine is not only more uſeful at ſea, than the common one, as not requiring a ſteady poſition; but may have its ſcale of variation conſiderably enlarged, by making the bore of the tube CD very ſmall, in proportion to the capacity of its head C.

But it is obſerved, that in long keeping this inſtrument, the included air loſes ſomewhat of its elaſticity; whereby, in proceſs of time, the water ſtands higher than it ought, and therefore indicates the gravity of the air to be greater than what it is.

The *Compound* BAROMETER, as invented by Mr. Rowning, is repreſented by Plate XVIII. *fig.* 9. hermetically ſealed at A, and open at C, being empty from A to D, filled with mercury from thence to B, and from B to E, with water. Let GBH be a horizontal line, then it is plain from the nature of the ſyphon, that all the compound fluid contained in the part from H to G, will be always in equilibrio with itſelf, be the weight of air what it will; becauſe the preſſure at H and G muſt be equal: whence it is evident that the column of mercury DH is in equilibrio with the column of water GE, and a column of air of the ſame baſe conjointly, and will therefore vary with the ſum of the variations of each of theſe.—The great property of this barometer is, that the ſcale of variation may be increaſed at pleaſure.

But of all the barometers above deſcribed there is none equal to the common one, which is made in the following manner: Having filled a glaſs tube with quickſilver, and covered the orifice with your finger and inverted it, and immerſed the finger in a veſſel of quickſilver; upon drawing the finger from the orifice, the quickſilver will never wholly ſubſide. If the tube be long enough, it will ſubſide in part, till it reſts at a certain altitude, generally between 31 and 28 inches; but if the tube be ſhorter than that altitude called the ſtandard, it will not ſubſide at all: due care muſt be taken in filling the tube to expel all the air-bubbles that adhere to the inſide of the tube, which may be done by putting a ſlender wire in the tube, and ſtirring it up and down; or if the tube and quickſilver be very clean, which they ought to be, you may effect it by leaving about an inch or leſs of the tube unfilled, and then putting your finger on the orifice, and inverting it gently, that the air in the vacant part may aſcend gradually along the tube, and ſweep up the little air-bubbles along with it; and laſtly, by inverting it gradually to its former poſition, and fillingit up with quickſilver.

In this laſt method care muſt be taken not to let the large air-bubble aſcend too quick, leſt by its ruſhing againſt the crown of the tube with violence it ſhould break it. Alſo in emptying the tube, for fear of the ſame accident, take care firſt to incline it; then to draw the orifice gently above the ſurface of the ſtagnant quickſilver, and immediately immerſe it again, ſo as to take in but little air at a time. This is the method of making barometers, which will be complete when placed in a frame, having at the ſide a ſcale of three inches divided into tenths, with a nonius dividing each ſaid diviſion into ten more, and placed at the height of twenty-eight inches above the ſurface of the quickſilver in the baſon. The weather-glaſs complete is repreſented by Plate XVIII. *fig.* 10. containing the barometer, thermometer, and hygrometer. See THERMOMETER and HYGROMETER.

Mr. Cummins, an ingenious clock-maker in London, has lately invented a clock-barometer, or a clock that gives the height of the mercury in the barometer, for a certain time paſt; whereby we apprehend, that he pretends to know the reſiſtance

ance any mechanical body as a pendulum, &c. might have, in any intermediate ſpace, from the different denſities of the air. But if this is the caſe, we are aſſured that artiſts truſting to this curious machine alone, will find themſelves deceived; for the true denſity of the air cannot be diſcovered from the height of the barometer ſingly, but is compounded of the height of the barometer and thermometer jointly.

Doctor Bradley was very elaborate in making obſervations for finding the true denſity of the air, and, after ſome years labour, conſtructed the following rule, which he found never erred, viz.

Divide the height of the barometer expreſſed in tenths of inches, by 350+ the degrees of the height of Farenheit's thermometer, and the quotient will give a number that will be in proportion to the mean denſity of the air. The mean denſity of the air may be expreſſed by $\frac{296}{350+50}$ +,74.

For example; Suppoſe the height of the barometer 30,2, and the thermometer 60°, then will $\frac{30\times10+2}{350+60^{\circ}}$ =,736, &c. expreſs the proportion of the denſity of the air (at the time the barometer and thermometer have the above altitudes of the mercury) to the mean denſity. But again, ſuppoſe the height of the mercury in the barometer the ſame as before, viz. 30,2, and the thermometer = 30 degrees; then will $\frac{30\times10+2}{350+30^{\circ}}$ =,794, &c. be the proportion of the denſity of the air to the mean ſtate, which plainly ſhews that the height of the barometer ſingly will not give the true denſity of the air; for the height of the barometer is the ſame in each example; and yet from the variation of the thermometer, the true denſity differs in proportion from the mean denſity ,74, as the above numbers ,736, &c. and ,794, &c. differ in proportion from the number ,74.

BARON, the next degree of nobility below a viſcount and above a baronet.

BARONS *of the Exchequer*, the four judges to whom the adminiſtration of juſtice is committed, in matters relating to the revenues of the crown.

They were formerly barons of the realm; but are generally of late perſons learned in the law. They are obliged by their office to inſpect the king's accounts, and accordingly have auditors under them.

BARONS *of the Cinque Ports*, are the members of the houſe of commons ſent by the Cinque ports. See CINQUE PORTS.

BARON AND FEME, a term uſed in our law to ſignify the huſband in relation to his wife, who is called feme. They are conſidered only as one perſon, ſo that a huſband cannot be witneſs for or againſt his wife, nor the wife for or againſt her huſband, except in caſes of high treaſon.

BARON AND FEME, in heraldry, is when the coats of arms of a perſon and his wife are born per pale in the ſame eſcutcheon, the man's being always on the dexter, and the woman's on the ſiniſter ſide: but if the woman be an heireſs, her coat muſt be borne by the huſband on an eſcutcheon of pretence.

BARONET, a modern degree of honour, next to a baron, created by king James I. in order to ſettle a plantation in Ulſter, for which purpoſe each was to maintain thirty ſoldiers in Ireland for three years, after the rate of eight-pence ſterling per day to each ſoldier.

This honour is hereditary, and they have the precedence of all knights, except thoſe of the garter, bannerets, and privy counſellors.

BARONY, the honour and territory which gives title to a baron, whether he be a layman or a biſhop.

BAROSCOPE, the ſame with barometer. See BAROMETER.

The word is formed from βαρὺς, weight, and σκοπέω, to view.

BARR. See BAR.

BARRACAN, in commerce, a ſort of ſtuff reſembling camblet, but of a coarſer grain.

BARRACKS, or BARACKS, places erected for ſoldiers to lodge in, eſpecially in garriſons.

BARRATOR, in law, a common mover or maintainer of ſuits and quarrels, either in courts, or elſewhere.

Lambert derives the word from the Latin, *barathro*, or *balatro*, a vile knave.

BARRATRY, in the marine acceptation, implies a defrauding the owners by the maſter of the ſhip.

BARREL, in commerce, a round veſſel, in the form of a ſmall tun, for holding ſeveral ſorts of merchandize.

BARREL alſo implies a liquid meaſure, and is of three kinds, wine, beer, and ale. The firſt contains thirty-one gallons and a half; the ſecond thirty-ſix gallons; and the third thirty-two gallons.

BARREL likewiſe denotes a certain weight of ſeveral merchandizes, which not only differs in different commodities, but alſo in different places. A barrel of Eſſex butter weighs one hundred and ſix pounds; and a barrel of Suffolk butter two hundred and fifty-ſix pounds. The barrel of herrings ought to contain thirty-two gallons wine meaſure, and will hold about a thouſand herrings. The barrel of ſalmon muſt contain thirty-two gallons; the barrel of eels the ſame. The barrel of ſoap muſt weigh two hundred and fifty-ſix pounds.

BARREL, in mechanics, a name given by watch-makers to the cylinder about which the ſpring is wrapped; and by gun-ſmiths to the cylindrical tube of a gun, piſtol, &c. through which the ball is diſcharged.

BARREL, in anatomy, a pretty large cavity behind the tympanum of the ear, about four or five lines deep, and five or ſix wide. It is lined with a fine membrane, on which are ſeveral veins and arteries. See EAR.

Thundering BARRELS, in military affairs, common caſks or barrels filled with powder, and rolled upon the works of an enemy, in order to ſet them on fire, and drive him from the place intended to be attacked.

This fire-work is ſometimes nothing but a barrel of common powder, in which a fuſe is inſerted, and fired before the barrel is rolled towards the enemy; this fuſe fires the powder in the barrel, which by its exploſion creates great diſorder among the troops where it takes effect.

BARRICADE, or BARRICADO, in naval architecture, a ſtrong wooden rail or beam, ſupported by a range of ſmall pillars or ſtanchions, and extending as a fence a-croſs the fore-moſt part of the quarter-deck. In a ſhip of war, the vacant intervals between the pillars are commonly filled with cork, junks of old cable, or thick matts of platted rope: and on the upper-part, about a foot above the rail, there is a double rope-netting, ſupported by double cranes of iron: between the two parts of the netting, are ſtuffed a number of hammocks, filled with the ſeamen's bedding, to intercept and prevent the execution of ſwivel-ſhot, (ſwivel is a ſort of ſmall cannon) muſket-balls, &c. in the time of engagement. See DECK, HAMMOCK.

BARRICADE, in military affairs, a fence formed haſtily with baſkets of earth, trees, palliſadoes, or the like, to preſerve an army from the ſhot or aſſault of an enemy.

The moſt uſual materials for barricades of this kind, are pales or ſtakes croſſed with batoons, and ſhod with iron at the feet: they are commonly erected in paſſages or breaches.

BARREN-WORT, *Epimedium*, in botany, a plant having a creeping root, from which ariſe many ſtalks about nine inches high, divided at the top into three, which are again divided into three ſmaller ſtalks: upon each of theſe ſtands a ſtiff heart-ſhaped leaf ending in a point; of a pale green on the upper ſide, but grey underneath. A little below the firſt diviſion of the ſtalk, comes out the foot-ſtalk of the flowers, which is near ſix inches long, dividing into ſmaller, each of theſe ſuſtaining three flowers, which are cruciform, and of a reddiſh colour, with yellow ſtripes on their borders. In the center of the flower ariſes the ſtyle ſurrounded by four filaments; the germen is oblong, which afterwards turns to a ſlender pod, containing many oblong ſeeds. This plant flowers in May, and the leaves decay in autumn; but ſeldom ripens its ſeeds with us.

BARRIER, in fortification, a kind of fence made acroſs a paſſage or the entrance of a retrenchment, &c.

It is compoſed of large ſtakes about four or five feet high, placed eight or ten feet diſtant from one another, with tranſums, or over-thwart rafters to ſtop either horſe or foot. In the middle is a moveable bar of wood, that opens or ſhuts at pleaſure.

BARRING *a Vein*, in farriery, implies an operation performed on the veins of a horſe's legs, and other parts of his body, in order to ſtop the courſe of the blood, and leſſen the quantity of malignant humours flowing to that part. This operation, as it is founded on a falſe theory, ſo it is now never uſed by ſkilful farriers.

BARRISTER, in common law, implies a perſon qualified and impowered to defend the cauſe of clients in any of the courts of juſtice.

The word is formed from the Latin, *bar*, *barra*, the place where they ſtand to plead.

Barriſters are of two ſorts, diſtinguiſhed by the epithets outer and inner. The outer-barriſters are thoſe who plead without the bar. The inner-barriſters are thoſe who are allowed the privilege of pleading within the bar. But at the Rolls, and ſome other inferior courts, all barriſters are admitted within the bar.

BARROW, in ſome ſalt works, is a name given to wicker caſes in the form of a ſugar loaf, wherein the ſalt is put to drain.

BARRULET, in heraldry, ſignifies the fourth part of the bar, or one half of the cloſſet.

BARRULY, in heraldry, is when the field is divided bar-ways, that is, acroſs from ſide to ſide, into ſeveral parts.

BARRY, in heraldry, is when an eſcutcheon is divided bar-ways, that is, acroſs from ſide to ſide, into an even number of partitions, conſiſting of two or more tinctures, interchangeably diſpoſed. It is to be expreſſed in the blazon by the word *barry*; and the number of pieces muſt be ſpecified; but if the diviſions be odd, the field muſt be firſt named, and the number of bars expreſſed.

BARRY-BENDY is when the eſcutcheon is divided evenly, bar and bend-ways, by lines drawn tranſverſe and diagonal, interchangeably varying the tinctures of which it conſiſts.

BARRY-PILY is when a coat is divided by ſeveral lines drawn obliquely from ſide to ſide, where they form acute angles.

BARSANIANS, in eccleſiaſtical hiſtory, a ſect of heretics in the ſixth century, who followed the errors of the Cainites and Theodoſians; and were ſo called from one Barſinius their leader.

They made their ſacrifices conſiſt in taking wheat flour

flour on the top of their fingers, and carrying it to their mouths. They never eat meat with other men; and maintained the Holy Ghoſt to be a creature.

BARTERING, in commerce, the exchanging one commodity for another, or ſending a merchant a parcel of goods, and taking others of him in exchange.

The word is formed from the Spaniſh, *baratar*, to deceive, or circumvent; becauſe, perhaps, thoſe who deal this way, endeavour to over-reach one another.

BARTHOLOMITES, a religious order founded at Genoa, in the year 1307; but the monks leading very irregular lives, the order was ſuppreſſed by pope Innocent X. in 1650, and their effects confiſcated.

BARTRAMIA, in botany, a decandrious plant, which grows naturally in both the Indies. It riſes with a ſoft ſtem, about four feet high, dividing into ſeveral branches at the top, which are furniſhed with roundiſh angular leaves, ſoft, like thoſe of the mallow, and a little hoary on their under ſide. The flowers are produced at the wings of the leaves, each having five ſmall yellow petals, which form a ſhort tube at their baſe, but ſpread open above the empalement; the flower is ſucceeded by a globular fruit, armed on every ſide with ſpines, which ſplit into four parts, each having a ſingle ſeed. This plant is perennial, and propagated by its ſeeds; but being a native of the hotteſt countries, it requires a ſtove in this climate.

BARUCH, the name of an apocryphal book, ſubjoined to the canon of the Old Teſtament.

It has been reckoned part of Jeremiah's prophecy, and is often cited by the ancient fathers as ſuch. Joſephus tells us, that Baruch was deſcended from a noble family. It is added, that he wrote the book himſelf, while he continued at Babylon; but at what time is uncertain.

There are three copies of this book, one in Greek, the other two in Syriac: one of the latter agrees with the Greek, but the other varies from it. In what language it was written, whether one of theſe copies be not the original, or which of them may be ſo, is difficult to determine.

BARUTH, an Indian meaſure containing ſeventeen gantans, and ought to weigh three pounds and an half Engliſh averdupoiſe.

BARULES, in eccleſiaſtical hiſtory, a ſect of heretics, who held that the Son of God had only the phantom of a body; that ſouls were created before the world, and that they lived all at one time.

BAS-RELIEVE. See BASSO-RELIEVO.

BASALTES, in natural hiſtory, a ſpecies of marble of a very fine texture, and of a deep gloſſy black colour.

The moſt remarkable quality of this marble is its figure, being never found in ſtrata, like other marbles, but always ſtanding up in form of regular angular columns, compoſed of a number of joints placed on and nicely fitted to each other, as if formed by the hand of a ſkilful workman. It is remarkably hard and heavy, will not ſtrike fire with ſteel, and makes a fine touchſtone.

The Giants-Cauſeway in Ireland, is entirely compoſed of the baſaltes; and is, perhaps, the moſt ſurprizing natural production of this kind in the world.

BASE, in architecture, is the loweſt part or foot of a pillar on which it ſtands, or that part that lies upon the pedeſtal under the body. It is likewiſe uſed for all the ſeveral ornaments or mouldings that reach from the apophyges, or riſing of the ſhafts of pillars, to the plinth.

BASE *of a Column* is that part between the ſhaft and pedeſtal, if there be any; if not, between the ſhaft and plinth, or zocle: the ornaments of the baſe are different in different orders.

The Tuſcan BASE conſiſts only of a ſingle tore, beſides the plinth.

The Doric BASE has an aſtragal, introduced by the moderns, more than the Tuſcan.

The Ionic BASE has a large tore over two ſlender ſcotias, ſeparated by two aſtragals.

The Corinthian BASE has two tores, two ſcotias, and two aſtragals.

The Compoſite BASE has two tores, two ſcotias, and one aſtragal.

The Attic BASE has two tores and a ſcotia, and is a proper baſe either for the Ionic or Compoſite columns.

BASE *Rudentee*, in architecture, is that which has its tores cut like cables.

BASE, in fortification, the exterior ſide of the polygon, or that imaginary line which is drawn from the flanked angle of a baſtion to the angle oppoſite to it.

BASE *of a Figure*, in geometry, denotes the loweſt part of its perimeter.

BASE *of a Triangle*, is properly the loweſt ſide, or that which is parallel to the horizon, though any ſide occaſionally is called the baſe.

BASE *of a Solid* is that ſide on which it ſtands, or the loweſt part thereof.

BASE *of a Conic Section* is a right line in the hyperbola and parabola, formed by the common interſection of the ſecant plane and the baſe of the cone.

BASE, in perſpective, the common ſection of a picture and the geometrical plane.

BASE, in gunnery, the leaſt ſort of ordnance, the diameter of whoſe bore is $1\frac{1}{4}$ of an inch, its weight 200 pound, length 4 feet, its ſhot a pound and

and a half in weight, and its diameter one inch and one-eighth.

BASE *of the Heart*, in anatomy, denotes its upper part. See HEART.

BASE *Eſtate*, in law, implies the eſtate held by a baſe tenure.

BASE *Tenure*, the holding by villenage, or other cuſtomary ſervices.

BASE *Fee* is to hold in fee at the will of the lord.

BASE *Court*, any court not of record.

BASEMENT, in architecture, implies a baſe continued a conſiderable length, as round a houſe, room, &c.

BASHAW, a Turkiſh governor of a province, city, or other diſtrict.

BASIL, *Ocymum*, in botany, a genus of didynamious plants. One of the ſpecies called buſh-baſil, has a fibrous ſmall root, with a ſtalk about ſix inches high, ſpreading out into branches that are a little woody, forming an orbicular head: the leaves are like thoſe of marjoram, of a purpliſh caſt, ſtanding oppoſite on ſhort footſtalks; the flowers are produced in whorles toward the top of the branches, of a white colour and purpliſh caſt; they conſiſt of a labiated petal, whoſe creſt, or upper-lip, is erect, roundiſh, notched, and larger than the beard of the lower lip, and cut into five parts; the calyx is cut on the edges into four parts, the uppermoſt of which is hollow like a ſpoon, and the piſtil which riſes out of it is attended with four embryoes, which afterward become as many ſeeds.

This and the common ſort are both propagated by ſeeds, which ſhould be ſown the beginning of April, on moderate hot-beds; and when the plants are up, they ſhould be removed to another, obſerving to water and ſhade them till they have taken root: in May they ſhould be taken up with a ball of earth to the roots, and tranſplanted either in pots or borders. Theſe plants have a ſtrong ſcent like cloves, too powerful for moſt perſons, but to ſome they are very agreeable.

The leaves and ſeeds of baſil are cephalic, cordial, and pectoral: ſome powder the dried leaves, and make them into ſnuff, which they think has a better effect than common ſnuff. It is alſo much uſed by ſome cooks in their ſoups and ſauces.

BASIL, among joiners, the ſloping edge of a chiſſel, or of the iron of a plane. They uſually make the baſil twelve degrees for ſoft wood, and eighteen for hard; it having been found by experience, that the more acute the baſil is, the better it cuts; and the more obtuſe it is, the ſtronger and fitter for ſervice.

Order of St. BASIL, the moſt ancient of all the religious orders, and was very famous in the Eaſt during the latter part of the fourth century; though ſome doubt whether St. Baſil was really the founder.

BASILARE *Os*, in anatomy, the ſame with os ſphenoides. See SPHENOIDES.

BASILIC, in ancient architecture, implies a large hall, or public room, with iſles, porticoes, galleries, tribunals, &c. being the term applied to thoſe places where princes ſat and adminiſtered juſtice in perſon.

The word is Greek, βασιλικη, and ſignifies a royal houſe, or palace.

The word is now uſed to ſignify ſuch churches, temples, &c. as far ſurpaſs the other ſtructures of the ſame kind in grandeur and magnificence.

BASILICA, in anatomy, the interior branch of the axillary vein, running the whole length of the arm. See VEIN.

BASILICON, in pharmacy, an epithet given to ſeveral compoſitions to be found in ancient medicinal writers. At preſent it is confined to two officinal ointments, diſtinguiſhed by the epithets black and yellow; and formerly much uſed by ſurgeons in dreſſing wounds.

BASILICS, in antiquity, a body of the Roman laws, tranſlated into Greek. In this ſyſtem is comprehended the inſtitutes, digeſts, code, novels, and ſome edicts publiſhed by Juſtinian and other emperors.

BASILICUS, in aſtronomy, a ſtar of the firſt magnitude, in the conſtellation Leo, called alſo regulus, and cor leonis, or the lion's heart. See REGULUS.

BASILIDIANS, a ſect of heretics in the ſecond century, and ſo called from their leader Baſilides, a diſciple of Menander. He flouriſhed in Egypt about the year 112, and there chiefly propagated his hereſy.

Baſilides, in the creation of things, admitted a certain ſucceſſive ſcale, in which each link of beings created the ſucceeding, and were themſelves created by the preceding; and conſequently, that one being only owed its exiſtence to God. He alſo taught that there were 365 heavens between the earth and the empyrean; and that each of theſe heavens had a moving and creating angel aſſigned to it; which angel was itſelf created by the next angel above him.

With regard to the Chriſtian religion, Baſilides taught, that Chriſt did not really ſuffer upon the croſs; but that Simon the Cyrenean was ſubſtituted in his room; that the promiſcuous copulation of men and women was lawful: that a Chriſtian may renounce the faith to avoid martyrdom; and that the ſoul alone is to be ſaved, and the body never to riſe from its ſtate of corruption.

BASILISK, a fabulous kind of ſerpent, ſaid to be produced from a cock's egg hatched by a ſerpent, and ſuppoſed to kill by its breath or ſight only.

BASILISK, in military affairs, implies a piece of ordnance, carrying a ſhot of forty-eight pounds, and

and weighing about ſeven thouſand two hundred pounds.

BASIOGLOSSUS, in anatomy, a muſcle ariſing from the baſe of the os hyoïdes, and running along the middle of the tongue towards its apex. It is aſſiſted by the ceratogloſſus, and draws the tongue backwards.

The word is formed from the Greek, βασις, the baſe or foundation, and γλωσσα, the tongue.

BASIS, the ſame with baſe. See BASE.

BASKETS *of Earth*, in the military art, ſignify ſmall baſkets filled with earth, and uſed in ſieges on the parapet of a trench. The French call them *corbeilles*. They are generally a foot and a half high, the ſame in diameter at the top, and eight or ten inches at bottom; ſo that when ſet together, a ſort of embraſures are left at their bottoms, through which the ſoldiers fire, without expoſing themſelves.

BASKET-SALT, a very fine ſalt, much purer, whiter, and compoſed of ſmaller grains than the common ſort.

BASKET-TENURE, a tenure of lands by the ſervice of making the king's baſkets.

BASON, in anatomy; ſee the article PELVIS.

BASON, in mechanics, a term uſed by glaſs grinders for a diſh of copper, iron, &c. in which they grind convex glaſſes, in the ſame manner as concave ones are ground on ſpheres.

The hatters call the iron mould in which they form the matter of their hats, a baſon; and they give the ſame name to the leaden one for the brims of hats; the latter has an aperture in the middle big enough for the largeſt block to go through.

BASON or FOUNTAIN, among gardeners, implies a reſervoir for holding water either for the ornament or uſe of the garden.

Theſe reſervoirs are made in divers forms, ſome round, ſome oblong or oval, others ſquare, octangular, &c. but their moſt common form is circular; and if the ground will permit, the larger they are the better; and when they exceed in ſize, they are called pieces of water, canals, fiſh-ponds, pools, &c.

In making theſe, care ought to be taken to avoid both extremes, and not to make them too big or too little, that a water-work may not take up the beſt part of a ſmall piece of ground; nor to make too little a baſon in a large ſpot. This muſt depend entirely on the judgment of the deſigner of the garden.

BASON *of a Dock*, a place where the water is prevented from running out at the tide of ebb, by double flood-gates: its uſe is to have ſhips repaired, either before they go into, or after they leave the dock.

BASON alſo ſignifies ſome part of a harbour, which opens from a narrow channel, into a wide and ſpacious reſervoir for ſhipping.

BASONS *of a Balance*, the two ſcales or diſhes faſtened, by ſtrings or chains, to the extremities of the beam; one for holding the weights, and the other the commodity to be weighed.

BASS, in muſic, that part of a concert which conſiſts of the graveſt and deepeſt ſounds, and is played on the largeſt pipes or ſtrings of a common inſtrument, as of an organ, lute, &c.

The baſs is the principal part of a muſical compoſition, and the foundation of harmony; for which reaſon it is a maxim among muſicians, that when the baſs is good, the harmony is ſeldom bad; and the contrary.

Counter BASS is a ſecond or double baſs, where there are ſeveral in the ſame concert.

Thorough BASS, or *Baſſ Continuo*, is the harmony made by the baſs viols, theorbos, &c. continuing to play both while the voices ſing, and the other inſtruments perform their parts, and alſo filling up the intervals when any of the other parts ſtop. It is played by figures marked over the notes on the organ, harpſichord, &c. and frequently ſimple and without figures, on the baſs-viol and baſſoon.

M. Broſſard obſerves, that the thorough baſs is a part of the modern muſic; and that it was invented by Ludovico Viadana, an Italian, in the year 1600.

BASSOON, a muſical inſtrument of the wind ſort, blown with a reed. It is furniſhed with eleven holes, and uſed as a baſs in a concert of hautboys, flutes, &c.

BASSO-RELIEVO, or BASS-RELIEF, a piece of ſculpture, where the figures do not protuberate, or ſtand out far beyond the plane on which they are formed.

BASS-VIOL, a muſical inſtrument reſembling a violin in the ſhape, but much larger. It is ſtruck with a bow, like a violin, has generally the ſame number of ſtrings, and eight ſtops, which are ſubdivided into ſemi-ſtops. Its ſound is grave, and has a very noble effect in a concert.

BASTARD, a natural child, or one born of a woman not married.

By the laws of England, a baſtard is incapable of inheriting lands, as the heir of his father; nor can any one inherit lands as heir to him, except the children of his own body; for by order of law, a baſtard has no relation, and he himſelf is accounted the firſt of his family.

BASTARDY, a defect of birth, objected to one born out of wedlock, and is either general or ſpecial.

General BASTARDY is a certificate from the biſhop of the dioceſe to the king's juſtices, after enquiry made whether the party is a baſtard or not, upon ſome queſtion of inheritance.

Special BASTARDY is a ſuit commenced in the king's courts againſt a perſon that calls another baſtard.

BASTERNA, a ſort of vehicle reſembling our chariots, much uſed by the ancient Roman ladies.

BASTION, in fortification, is among the moderns what was formerly called a bulwark; and conſiſts of two faces and two flanks. It is uſually made at the angles of forts of a large heap of earth, ſometimes lined with bricks, ſods, turfs, &c. but rarely with ſtone.

The lines AB and CB, are the faces of the baſtion B, Plate X. *fig.* 4. and the line CE, the flank of the ſaid baſtion B; likewiſe the line GF, GD, &c. the flank and faces of the baſtion D. The line EP is called the curtain, and OB and OD, the capitals of the baſtions D and B. For the different angles of the baſtion, ſee ANGLES.

It is a general rule with engineers in conſtructing a baſtion, or at leaſt ought to be, that every part be ſeen and may be defended from ſome other part of the baſtion; becauſe angles alone are not ſufficient, flanks and faces being very neceſſary. The faces ſhould never be more than thirty, nor leſs than twenty-four Rhineland perches. The longer the flanks the better, provided they ſtand at right-angles, with, and under the line of defence. It is the different diſpoſitions of the flanks that have introduced the various kinds of fortification, for on their good or bad diſpoſition, chiefly depends the defence. The angle at the baſtion ſhould never exceed ſixty degrees; otherwiſe it will be too ſmall to give room for guns, and will either render the line of defence too long, or the flanks too ſhort: it muſt therefore be either a right angle, or ſome intermediate one between that and ſixty degrees.

Compoſed BASTION is when two ſides of the interior polygon are very unequal, which alſo renders the gorges unequal.

Cut BASTION is that whoſe point is cut off, inſtead of which it has a re-entering angle, or an angle inwards with two points outwards; and is uſed either when the angle, would, without ſuch a contrivance be too acute, or when water, or ſome other impediment, prevents the baſtion from being carried to its full extent.

Demi BASTION has but one face and flank, and is uſually before a horn-work, or crown-work. This is called an EPAULEMENT.

Deformed BASTION is that which wants one of the demigorges, becauſe one ſide of the interior polygon is ſo very ſhort.

Double BASTION is that which is raiſed on the plane of another baſtion, leaving twelve or eighteen feet between the parapet of the lower, and foot of the higher.

Flat BASTION is a baſtion built in the middle of the curtain, when it is too long to be defended by the baſtions at its extremities.

Hollow BASTION is that which is only ſurrounded with a rampart and parapet, having the ſpace within void or empty.

Regular BASTION is that which has it true proportion of faces, flanks, and gorges.

Solid BASTION is that which has the void ſpace filled up entirely, and raiſed to an equal height with the rampart.

BASTON, in law, implies a ſervant to the warden of the Fleet-priſon, who attends the king's courts with a red ſtaff, for taking into cuſtody ſuch perſons as are committed by the court.

BASTON, or BATOON, in architecture, is a kind of moulding in the baſe of a column, called alſo a tore.

BASTON, or BATOON, in heraldry, is a kind of bend which has only one half of the uſual breadth. It reſembles a truncheon, and is the proper mark for baſtardy.

BAT, in natural hiſtory, a kind of mungrel, or amphibious ſort of animal, partaking both of the mouſe and bird, and flying though without feathers.

The bat, which the Latins called veſpertilio, ſeems to be a medium between the quadruped and the feathered kinds. They lay themſelves up during the winter in the drieſt receſſes of caverns; where, fixing their talons to the roof, they cover their bodies with their wings, and in that poſition ſleep for ſeveral months.

BATABLE *Ground*, the lands which lay between Scotland and England, when the kingdoms were diſtinct, and to which both nations pretended a right.

BATCHELOR, or BACHELOR, a ſingle man, who has never been married.

BATCHELOR was, formerly, a title given to thoſe who had obtained the honour of knighthood; but had not a ſufficient number of vaſſals to carry their banner before them in the field of battle.

BATCHELORS, in the univerſities, are perſons who have attained to the *baccalaureate*, or taken the firſt degree in the liberal arts or ſciences.

BAT-FOWLING, a method of catching birds in the night by lighting large candles, or torches, near the place where they are at rooſt; for, upon beating them up, they fly immediately to the flame, where they are eaſily caught in nets, or beat down with buſhes faſtened to the ends of poles.

BATH, *Balneum*, a ſufficient quantity of water collected in ſome convenient receptacle for perſons to waſh themſelves in, either for health or pleaſure: and is either hot or cold.

Hot BATHS, called by the ancients thermæ, produce the moſt ſalutary effects in a great number of diſeaſes; and owe their origin partly to an admixture of ſulphureous particles, while the water is paſſing through the ſubterraneous canals, and partly

ly to the fumes or vapours exhaling through the pores of the earth, where ſulphur is found either pure or impure, as in coals, amber, iron, nitre, &c.

Cold BATHS were held by the ancients in the greateſt eſteem; and the preſent age can boaſt of abundance of noble cures performed by them, and ſuch as were long attempted in vain by the moſt powerful medicines.

Artificial BATHS are of various kinds, and adapted to various diſorders; ſome are made of cephalic and nervous drugs boiled in light and pure water.

Vapour BATHS are where the vapours ariſing from burning ſpirits of wine, or from herbs boiled in wine, water, milk, &c. have immediate acceſs to either the whole body, or ſome particular parts.

BATH, in antiquity, a meaſure of capacity uſed among the Jews, containing the tenth part of an omer, or ſeven gallons and four pints as a liquid meaſure; or three pecks and three pints as a dry meaſure.

BATHS, in architecture, ſuperb buildings erected by the ancients for the ſake of bathing.

Knights of the BATH, a military order in England, inſtituted according to ſome authors by Richard II. who confined their number to four; but others ſay that it was founded by Henry IV. in the year 1399, and their number limited to forty-ſix.

Their motto is *tres in uno*, alluding to the three theological virtues.

BATH-KOL, the daughter of a voice, a name given by the Jews to one of their oracles. It conſiſts of a fantaſtical method of predicting future events by the firſt words they hear from any perſon's mouth, and which they conſider as a voice from heaven to inſtruct them in the matter they are enquiring about.

BATH-METAL, a mixed metal, conſiſting of copper combined with zinc, and generally called prince's metal. See PRINCE'S METAL.

BATMAN, in commerce, a kind of weight uſed at Smyrna, containing ſix okes, of four hundred drams each, which amount to ſixteen pounds, ſix ounces, and fifteen drams, Engliſh weight.

BATON, or BASTON. See BASTON.

BATRACHOMYOMACHIA, battle of the frogs and mice, the title of an elegant burleſque poem, commonly aſcribed to Homer.

The word is compounded of the Greek, βατραχος, a frog, μυς, a mouſe, and μαχη, a battle.

The cauſe of this battle is the death of Pſycharpax, a mouſe, ſon to Taxartes, who being mounted on the back of Phyſignathus, a frog, on a voyage to her palace, to which ſhe had invited him, was ſeized with fear, on ſeeing himſelf in the middle of a pond, ſo that he tumbled off and was drowned. The mice ſuſpecting that Phyſignathus had ſhaken him off with deſign, demanded ſatisfaction, and, by unanimous conſent, declared war againſt the frogs.

BATTALIA, an army drawn up in order of battle.

BATTALION, a ſmall body of infantry drawn up in order of battle, and ready to engage.

A battalion uſually contains from five to eight hundred men; but the number is not preciſely determined. They are divided into three companies, one of which is grenadiers. They are uſually drawn up with ſix men in file, or one before another. Some regiments conſiſt of one battalion only, while others are divided into four or five.

BATTEN, a name given by workmen to a ſcantling of wooden ſtuff, from two to four inches broad, and about an inch thick; the length is generally very conſiderable, but undetermined.

This term is chiefly uſed in ſpeaking of doors and window-ſhutters which are not framed with whole deal, &c. with ſtyles, rails and pannels, like wainſcot; but appear to the eye as if they were really ſuch, by means of theſe battens, bradded on the plain board round the edges, and ſometimes acroſs them up and down, in different manners, according as the workman would imitate this or that different kinds of wainſcot.

BATTENS *of the Hatches*, in the marine, long narrow ſcantlings of board, or the hoops of barrels; they are nailed along the edges of the tarpauling, which is a piece of tarred canvas of ſufficient capacity to cover the hatches at ſea: the battens confine the edges of the tarpaulings cloſe down, to prevent the water, which may ruſh over the decks in a ſtorm, from penetrating into the lower apartments of the ſhip. See HATCHWAY.

BATTERING, in the military art, implies the attacking a place, work, or the like, with heavy artillery.

BATTERING-PIECES are large pieces of ordnance proper for battering a fortification. See CANNON.

BATTERING-RAM, a machine uſed by the ancients in ſieges, for battering the walls and towers of a fortified place.

The uſe of this machine is very ancient, and the invention of it aſcribed to different people. It was of two kinds, ſlung or unſlung.

The former was compoſed of a large beam of oak, reſembling a ſhip's maſt, of prodigious length and thickneſs, having the end armed with a head of iron proportioned to the body, and reſembling that of a ram, and thence it had its name. This terrible machine, which according to Vitruvius weighed 440000 pounds, was ſuſpended, and equally ballanced, like the beam of a pair of ſcales, with a chain, or a large cable, which ſupported it in the air in a ſtrong frame of timber, which

which was pushed forwards, on the filling up of the ditch, to a certain distance from the wall, by means of rollers or wheels. The frame was secured from being set on fire by the besieged, by several coverings, with which it was then cased over.

The unsuspended ram differed from this only in the manner of working it: for, instead of being slung by a chain or cable, it moved on small wheels on another large beam.

BATTERING-RAM, in heraldry, is a bearing, or coat of arms, resembling the military engine of the same name.

BATTERY, in military affairs, all places where cannon, mortars, &c. are mounted, are called batteries, whether to fire on an enemy's troops, or to attack or destroy a fortification.

In an engagement cannon are fired without being covered, that is, without having any ground thrown up to cover or defend the persons appointed to charge and work them. For as the pieces in these cases have no fixed situation, but are perpetually changing place, as the general finds necessary, the difficulty of covering them is evident, and the haste in which these kind of actions are performed, does not permit the use of that precaution, which would render the service much less dangerous. But in the attack of a place it is otherwise, as the cannon are fixed firmly each in its proper place, and it is absolutely necessary to their being made use of, that they should be placed behind a parapet, thick enough to resist the cannon-shot of the besieged.

The construction of a parapet is what is properly called the construction of a battery; we shall give the particulars of it, as they stand in M. de Vauban's Memoirs.

The bed of the cannon, that is, the spot on which it is placed, should, if possible, be raised some feet above the level of the field.

The parapet should be three fathoms thick, and seven feet and a half high.

These parapets are constructed of earth and fascines, which are a kind of faggots.

The situation and extent of these batteries are first marked out (so as they may be parallel to the parts of the fortification intended to be destroyed) by laying down a line, or the match-cord; this done, the ground before the battery is broke, and a small trench opened; a bed of the earth that is dug out, is first laid and well beaten down; then a layer of fascines is placed transversely upon the earth, or so that their length shall reach from side to side of the parapet, crossing it at right angles; and so alternately a bed of earth and a layer of fascines, the fascines well fastened together, and stakes driven through them, so as to make the several layers of fascines and earth as it were one body; both sides of the parapet are also faced or lined with fascines, laid lengthways, or parallel to the parapet, and well fastened with stakes to the inside of it.

This parapet being raised two feet and an half, or three feet, the embrasures must be marked on the outside. Embrasures are well known to be the opening in parapets to receive the cannon, and the part between two embrasures is called the merlon; from the middle of one embrasure to another ought to be eighteen feet: the embrasure ought to be three feet wide on the inside, and nine feet on the outside of the parapet.

The embrasures being marked out, the rest of the parapet, called the epaulement of the battery, must be raised, leaving the space marked for the embrasures open; that part of the parapet above the embrasures must have a proper slope, or shelving, that the materials of the parapet, or of the merlons may not be beat down into the embrasures.

That part of the parapet which reaches from the ground to the bottom of the embrasures, is called the knee of the battery.

The parapet being finished, platforms must be prepared over-against the embrasures, to place the cannon upon.

These platforms are a kind of strong floors, made to prevent the cannon from sinking into the ground, and to render the working of them more easy. They are composed of joists, or pieces of wood laid lengthways, the whole length of the intended platform; and, to keep them firm in the places they are laid in, stakes must be driven into the ground close to them on each side; these joists must then be covered with very thick planks, laid parallel to the parapet; and over that part of the last which touches the inside of the parapet, a kind of thick girder, or rafter, must be placed, called a *beurtoir*, or *knocker*, because when the cannon is fired, the wheels of its carriage first knock or strike against it, and immediately afterwards recede from it, by the effort of the powder made against the breech of the piece, which is the cause of what is called its recoil. See the article CANNON.

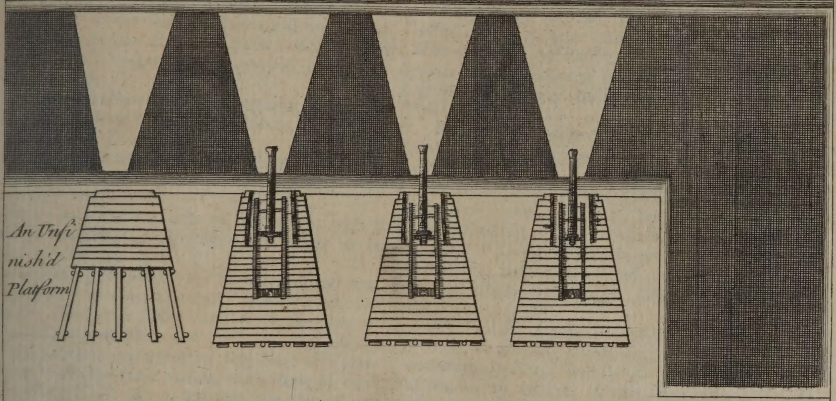
As a check to this recoil, and to render it as little as possible, the ground, on which that part of the platform is laid which is farthest from the parapet, should be raised, as much as circumstances will permit, higher than the part nearest the parapet.

Platforms ought to be eighteen or twenty feet long, seven and an half wide near the parapet at their narrowest part, and thirteen at the widest.

When the platforms are finished, the cannon must be brought to the batteries, and placed with their carriages on the several platforms allotted them.

It is usual to make little cells or cavities near the batteries, and at a convenient distance from each

Fig. 1. Plan of a Battery of Cannon.



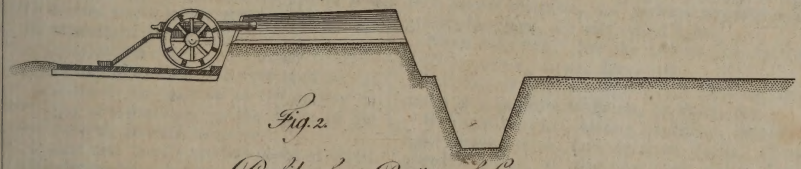
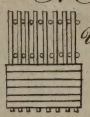


Fig. 2.

Profile of a Battery of Cannon

Fig. 3. Plan of a Bomb Battery

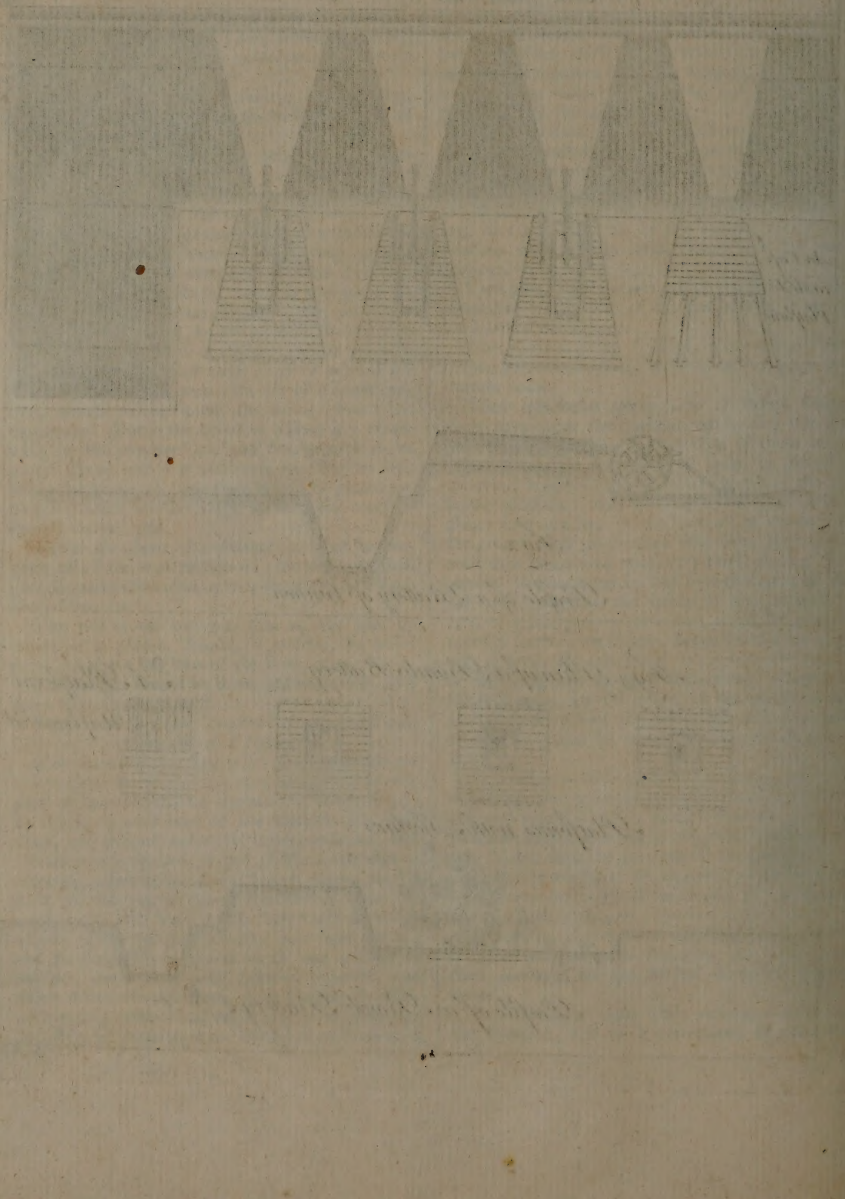
A Platform Unfinish'd



Platforms with Mortars

Profile of a Bomb Battery.

T. Ledge Sculp.



each other, in which to keep the gun-powder. These cells are covered with clay, or something of the like kind, to preserve them from being fired, and are called little magazines of the battery. A place is prepared at a greater distance, where a larger quantity of powder is kept, which serves as a magazine to the smaller places just mentioned. The powder is thus divided to prevent accidents by fire, and these magazines are guarded by soldiers sword in hand.

All that remains concerning batteries of cannon, after what we have said on the subject, will be seen by the *fig.* 1. in Plate XIX.

Fig. 1. represents the plan of a battery, with its platforms, and the cannon placed thereon, facing the embrasures.

Fig. 2. shews the profile of a battery, with a piece of cannon, in its embrasure, ready to be fired.

After having treated of the batteries of cannon, it is proper to give some account of the batteries of mortars; but these differ little from the former. They are constructed in the same manner, except that they have no embrasures; they have also platforms made in the same manner with those of cannon. Plate XIX. *fig.* 3. exhibits the plan of one of those batteries, with a profile, representing a mortar at the moment of giving fire.

When the enemy is near enough to see or command the batteries in flank, his view must be cut off, by continuing the parapet of the battery in another angle, as represented in the figure of the battery of cannon, referred to above.

The bullets and bombs are laid down in readiness, beside the merlons, between the embrasures.

Besides these, there are batteries of various kinds, as sunk, direct, sweeping, reverse, cross, and rebounding batteries.

Sunk BATTERIES have their platforms sunk below the level of the field, so as that the ground serves for the parapet, in which embrasures may be made.

Direct BATTERIES are those which batter the sides of the work, before which they are placed almost at right angles.

Sweeping BATTERIES, or batteries *d'enfilade*, are those which scour or sweep the sides of some work in a straight line.

The *Reverse* (*revers*) are those which batter from behind, that is, play on the backs of those posted on the work to defend it.

Cross BATTERIES are those which play athwart each other, and whose fires, if continued after their meeting, would almost cross at right angles.

Rebounding BATTERIES, (or *batteries d'echarpe*) are those whose stroke make no more than an angle of twenty degrees, with the faces or sides of what they are directed against. These are also sometimes called *glancing batteries* (*de bricole*) because the bullet, only glancing, as it were, on the place it is directed against, is thrown off to the parts adjacent, almost like the bricole, or transverse stroke at billiards, which falls on the cushion in an oblique direction.

BATTERY, in law, the striking, beating, or offering any violence to another person, for which damages may be recovered: but if the plaintiff made the first assault, the defendant shall be acquitted, and the plaintiff amerced to the king for his false suit.

Battery is frequently confounded with assault, though in law they are different offences; and the defendant may be found guilty of assault, though acquitted of the battery: there may therefore be an assault without a battery; but battery always implies an assault. See ASSAULT.

BATTEURS *d'Estrade*, are scouts sent out on horseback before the front, and on the wings of an army, some miles distance to make discoveries.

BATTLE, a general engagement between two armies, in a country sufficiently open for them to encounter in front, and for the greater part at least of the line to engage. Other great actions, though of a longer duration, and perhaps attended with greater slaughter, are only called fights.

Naval BATTLE. See the articles SEA-FIGHT, ENGAGEMENT, LINE, DIVISION.

BATTLE is also used figuratively for a representation of a battle in sculpture, painting, &c.

BATTLE-ROYAL, among sportsmen, implies a fight between three, five, or seven cocks, all engaged together, so that the cock which stands longest wins the battle.

BATTLE-AX, a kind of halbert formerly used by the infantry, and first introduced into England by the Danes.

BATTLEMENTS, in architecture, are indentures or notches in the top of a wall, or other building, in the form of embrasures.

BATTOLOGY, in grammar, implies a superfluous repetition of some words or sentences.

BATTON, or BATTOON. See BASTON.

BATTORY, in commerce, a name given by the Hanse-towns to their warehouses in foreign countries.

BAVINS, in the military art, are faggots of brush-wood, with the brush at length.

BAUHINIA, in botany, a genus of decandrious plants, the flower of which consists of five lanceolated petals, with attenuated and reflexed tops; it hath ten filaments topped with ovated antheræ; the style is filiform, and placed on an oblong germen, which turns to a long cylindrical legumen, containing many roundish compressed seeds.

BAUM, *Melisa*, in botany, a genus of didynamious plants. The common sort cultivated in

gardens, hath a long, round, fibrous, perennial root, from which arifes a fquare ftalk, which is annual, and branched. The leaves, which are fet by pairs at each joint, are oblong, pointed, of a dark green, dented at their edges, and fomewhat hairy, in the bofoms of which come forth the flowers, which conſiſt of a ſingle labiated petal, whoſe upper-lip is roundiſh, upright, and indented at the extremity in two parts; but the under-lip is cut into three parts; the piſtillum is attended with four embryos, that turn to as many ſeeds, joined together, of a roundiſh ſhape, ſitting in the calyx; the flowers are white, and appear in July: the whole plant has an agreeable ſcent, ſomewhat like lemons. It is propagated by planting the roots in autumn, which may be divided into ſmall pieces, and planted in beds of common earth, at about a foot aſunder.

Baum is ſaid to be cordial, cephalic, and to fortify the ſtomach; it is taken in the manner of tea, and is by ſome greatly eſteemed for that purpoſe, and acidulated with lemon juice, as a diluter in acute diſorders.

Molucca BAUM. See MOLUCCELLA.

Turkey BAUM. See DRACOCEPHALUM.

BAY, a gulph or inlet of the ſea-coaſt, comprehended between two capes or points of land, where veſſels frequently ride at anchor ſheltered from the wind.

BAY, among farmers, that part of a barn where the corn is laid up, or the mow made. Thus if a barn conſiſt of a floor and two heads, they call it a barn of two bays.

BAY is alſo one of the colours of the coat of horſes, and has, perhaps, its name from reſembling the colour of dried bay-leaves.

There are various degrees of this colour from the lighteſt bay to the dark, that approaches the neareſt to the brown, but always more gay and ſhining. The bright bay is an exceeding beautiful colour, becauſe a bright bay horſe has often a reddiſh daſh with a gilded aſpect, his mane and tail black, with a black or dark liſt down his back. The middle colours of bay alſo have often the black liſt with black mane and tail; and the dark bays have almoſt always their knees and paſterns black, and we meet with ſeveral ſorts of bays that have their whole limbs black from their knees and hocks downwards. The bays that have no liſts down their backs, are, for the moſt part, black over their reins, which goes off by an imperceptible gradation from dark to light, towards the belly and flanks: ſome of theſe incline to a brown, and are more or leſs dappled.

The bay is one of the beſt colours, and horſes of all the different kinds of bays are commonly good, unleſs when accidents happen to ſpoil them when they are colts. *Gibſon on Horſes.*

BAY, among huntſmen, is a term applied to a deer, which after having been hard run, turns about, and defends himſelf with his horns againſt the dogs; in which caſe he is ſaid to ſtand at bay.

BAY-SALT. See SALT.

BAY-TREE, *Laurus*, in botany. This plant in hot countries grows to a conſiderable height, has a ſmooth trunk without knobs, and long branches. The leaves are long, ſharp, hard, nervous, and ſmooth; but have little juice, though they have a fine ſmell, and an acrid, bitter, aſtringent taſte. The flowers conſiſt of a ſingle petal, which is ſhapped like a funnel, and divided into four or five ſegments, and are male and female: the embryo of the female flowers becomes a berry, incloſing a ſingle ſeed, within a horny ſhell, which is covered with a ſkin. Bay-trees are propagated either from the ſeeds, or by laying down the branches.

This tree, among the ancients, was accounted a panacea; and the leaves, berries, and bark of the roots, were of uſe. The leaves are heating, reſolvent, ſtrengthen the ſtomach, help digeſtion, and diſcuſs wind: for theſe purpoſes the infuſion may be drank as tea, or the powder may be given to the quantity of a dram. The berries are more heating than the leaves, and two ſcruples in infuſion is a doſe; but their principal uſes in the preſent medical practice is in clyſters, and the leaves as a fomentation.

BAY, *Sweet-flowering*, in botany, a ſpecies of the tulip tree. See MAGNOLIA.

BAYONET, in the military art, implies a ſhort broad dagger, with a hollow handle of iron, of a circular form, fitted to the muzzle of the piece where it is faſtened; ſo that the ſoldier fires with the bayonet on the muzzle of his piece, and is always ready to act againſt the horſe.

BAYS, in commerce, a ſort of open woollen ſtuff, having a long nap, ſometimes friſed, and ſometimes not. It is without any wale, and wrought in a loom with two treddles like flannel.

Bays are chiefly manufactured at Colcheſter and Bocking, in Eſſex. The exportation of this ſtuff was formerly more conſiderable than at preſent, the French having now learned the manufacture. The Engliſh bays are, however, ſtill ſent in great quantities to Spain and Portugal, and even to Italy. Their chief uſe is for cloathing the monks and nuns, and for lining the ſoldiers cloaths. The looking-glaſs makers alſo uſe bays behind their glaſſes to preſerve the tin foil.

The breadth of bays is commonly from a yard and a half to two yards, and the length from forty-two to forty-eight.

BAZAR, or BAZAARD, among the eaſtern nations, a market, or place deſigned for trade.

BAZAT, in commerce, a long, fine cotton, brought from Jeruſalem, and is thence often called Jeruſalem cotton.

BDELLIUM, in the materia medica, a gummy reſinous juice, flowing from an oriental tree of which we have no deſcription. It is brought from Arabia and the Eaſt Indies in pieces of different magnitudes, of a dark reddiſh brown colour externally, not unlike myrrh; but internally clear, and ſomething reſembling glue. It is of an agreeable ſmell, and a bitteriſh ſlightly pungent taſte.

This gummy reſin is recommended as a corroborant and attenuant in diſorders of the breaſt, for promoting urine and the menſes, and externally for reſolving or maturating hard tumours; but is at preſent little uſed.

BEACON, a ſignal erected on ſome hill or eminence, for giving notice of the invaſion of an enemy.

It conſiſts of pitch-barrels placed upon high poles, and when the enemy appears, the barrels are ſet on fire; ſo that the flame in the night-time, and the ſmoak in the day, ſpreads the alarm thro' the whole country.

BEACON alſo ſignifies a mark erected as a warning to ſeamen againſt rocks, ſhelves, or ſands.

BEACONAGE, the tax paid for maintaining a beacon.

BEAD, in architecture, a round moulding, commonly made upon the edge of a piece of ſtuff, in the Corinthian and Compoſite orders, cut or carved in ſhort emboſſments, like beads in necklaces.

Sometimes a plain bead is ſet on the edge of each faſcia of an architrave, and ſometimes even an aſtragal is cut in this manner. A bead is often placed on the lining board of a door-caſe, and on the upper edges of ſkirting-boards.

BEAD-PROOF, among diſtillers, a fallacious method of determining the ſtrength of ſpirits.

It conſiſts in ſhaking a ſmall quantity of the ſpirits in a phial, when if the crown of bubbles ſtand for ſome time on the ſurface, the goods are eſteemed proof, that is, equal parts of rectified ſpirits and phlegm.

BEAD-TREE. See MELIA.

BEAGLE, the name of a particular kind of hunting-dogs, of which there are ſeveral ſorts.

BEAK, the bill or nib of a bird, from the form and ſtructure of which Linnæus divides the whole claſs into ſix orders. See BIRDS.

BEAK, in architecture, the ſmall fillet left on the head of a larmier, which forms a canal, and makes a kind of pendant.

Chin BEAK, a moulding the ſame with the quarter-round, except its ſituation, which is inverted.

BEAK-HEAD, in naval architecture, the name given to a ſhip's head whoſe fore-caſtle is ſquare; a circumſtance common to all veſſels of war that have two or more decks of guns. In ſmaller ſhips, the fore-caſtle is generally ſhaped like a parabola whoſe vertex lies immediately above the ſtem.

The ſtrong projecting pointed beaks uſed by the ancients in time of battle, are entirely diſuſed ſince the invention of gun-powder.

BEAKED, in heraldry, a term uſed to expreſs the beak or bill of a bird. When the beak or bill of a bird are of a different colour from that of the body, they ſay beaked and membered of ſuch a tincture.

BEAM, in architecture, is the largeſt piece of timber in any building lying acroſs it, and into which the feet of the principal rafters are framed. No building has leſs than two of theſe beams, that is, one at each head; and into theſe beams, the girders of the garret-floor are framed, as well as the teazle-tenons of the poſts, if the building be of timber.

The force and ſtrength of beams has been conſidered by the beſt authors, both in England and France, who have given preciſe computations for the reſiſtance of each, according to its length, and the dimenſions of the ſides; and, accordingly, the proportion of beams near London has been fixed by ſtatute as follows: A beam of 17 feet long muſt have the ſide of one of its ſquare ſides ten inches, and the other ſix; one of ſixteen feet long muſt have one eight, and the other ſix; one of fifteen feet, ſeven, and the other five inches.

Mr. Parent, a French mathematician, has endeavoured to prove, that if a beam in form of a parallelopipedon be fixed horizontally againſt a wall, its reſiſtance againſt breaking at the place of its inſertion will be as the area of the ſection at the wall, and the depth of the beam directly, and the length inverſely.

Let R and r repreſent the reſiſtances of two beams, fixed as above, whoſe lengths, breadths, and depths, are L, B, D, and l, b, d, reſpectively: then will $R : r :: \frac{B \times D^2}{L} \cdot \frac{b \times d^2}{l}$.

If P and p repreſent the reſpective weights that being appended at the extremities of their lengths, are ſufficient to break thoſe beams, we ſhall have $\frac{B \times D^2}{L} = P$, and $\frac{b \times d^2}{l} = p$; therfore $P \times p = \frac{B \times D^2 \times l + L \times b \times d^2}{L + l}$.

If the beam be fixed at both ends, then $B = b$, and $D = d$, whence $P + p = \frac{B \times D^2 \times L + l}{L \times l}$, which ſhews that the forces requiſite to break a beam in different points of its length, are as the rectangle of the ſegments of the length; for $B \times D^2 \times \overline{L \times l}$ being conſtantly the ſame, it follows, that $P + p$ is as $\frac{1}{L \times l}$; and, therefore, when $L = l$, $P + p$ will be

be the leaſt poſſible; conſequently a beam ſupported at both ends will require a leſs weight to break it in the middle, than at any other point of its length.

Hence if the baſes of two beams be equal, tho' both their heights and breadths be unequal, their reſiſtance will be as their heights alone; and, by conſequence, one and the ſame beam laid on the ſmalleſt ſide of its baſe, will reſiſt more than when laid flat, in proportion as the firſt ſituation gives it a greater height than the ſecond: and thus an elliptic baſe will reſiſt more, when laid on its greateſt axis, than when on its ſmalleſt.

Since in beams equally long, it is the baſes that determine the proportion of their weights or ſolidities, and ſince their baſes being equal, their height may be different; two beams of the ſame weight may have reſiſtances differing to infinity: thus, if in the one the height of the baſe be conceived infinitely great, and the breadth infinitely ſmall, while in the other the dimenſions of the baſe are infinite; the reſiſtance of the firſt will be infinitely greater than that of the ſecond, tho' their ſolidity and weight be the ſame. If therefore all required in architecture were to have beams capable of ſupporting vaſt loads, and at the ſame time be of the leaſt weight poſſible, it is evident they muſt be cut as thin as laths, and laid edgewiſe.

If the baſes of two beams be ſuppoſed unequal, but the ſum of the ſides of the two baſes equal, E. g. if they be either 12 and 12, or 11 and 13, or 10 and 14, &c. ſo that they always make 24; and farther, if they be ſuppoſed to be laid edgewiſe; purſuing the ſeries, it will appear that, in the beam of 12 and 12, the reſiſtance will be 1728, and the ſolidity or weight 144; and that in the laſt, or 1 and 23, the reſiſtance will be 529, and the weight 23: the firſt therefore, which is ſquare, will have leſs than half the ſtrength of the laſt, with regard to its weight.

Hence Mr. Parent remarks, that the common practice of cutting the beams out of trees, as ſquare as poſſible, is ill huſbandry: he hence takes occaſion to determine geometrically what dimenſions the baſe of a beam to be cut out of any tree propoſed ſhall have, in order to its being of the greateſt poſſible ſtrength; or, which is the ſame thing, a circular baſe being given, he determines the rectangle of the greateſt reſiſtance that can be inſcribed; and finds that the ſides muſt be nearly as 7 to 5. To inveſtigate this proportion of the ſides, put r for the radius of the given circular baſe, $2x$ for the required depth; then will $2\sqrt{r^2-x^2}$ expreſs the required breadth, by the nature of the circle; and conſequently $8x^2\times\sqrt{r^2-x^2}$ the reſiſtance, which muſt be a maximum; and therefore its fluxion $=0$: hence we get $x=r\times\sqrt{\frac{2}{3}}$, and the proportion of the ſide as $\sqrt{2}$ to 1, or 1.4 to 1 nearly, that is, as 7 to 5.

Hitherto the lengths of the beams have been ſuppoſed equal; if they are unequal, the baſes will reſiſt ſo much the leſs as the beams are longer.

To this it may be added, that a beam ſuſtained at each end, breaking by a weight ſuſpended from its middle, does not only break at the middle, but alſo at each extreme; or, if it does not actually break there, at leaſt immediately before the moment of the fracture, which is that of the equilibrium between the reſiſtance and the weight, its fibres are as much ſtretched at the extremes, as in the middle. So that, of the weight ſuſtained by the middle, there is but one third part which acts at the middle, to make the fracture; the other two only acting to induce a fracture in the two extremes.

A beam may either be ſuppoſed loaden only with its own weight, or with other foreign weights, applied at any diſtance, or elſe only with thoſe foreign weights. Since, according to M. Parent, the weight of a beam is not ordinarily above $\frac{1}{10}$ part of the load given it to ſuſtain; it is evident that, in conſidering ſeveral weights, they muſt be all reduced by the common rules to one common center of gravity.

Mr. Parent has calculated tables of the weights that will be ſuſtained by the middle in beams of various baſes and lengths, fitted at each end into walls, on a ſuppoſition that a piece of oak of an inch ſquare and a foot long, retained horizontally by the extremes, will ſuſtain 315 lb. in its middle, before it breaks, which it is found, by experience, it will. See *Mem. Acad. R. Scienc. an.* 1708.

BEAMS, in naval architecture, thick ſtrong pieces of timber, ſtretching acroſs the ſhip from ſide to ſide, to ſupport the decks and retain the ſides at their proper diſtance.

On the BEAM, in navigation, any diſtant object is ſo called when it bears on a line with the ſhip's beams: thus, if a ſhip lies north and ſouth, any object on the beam muſt bear eaſt or weſt; and hence,

Before the BEAM is an arch of the horizon included between a line, croſſing the ſhip at right angles, and the object ſeen in that ſituation: thus, if a ſhip ſteers north, and diſcovers another two points before the ſtarboard-beam, ſhe bears E. N. E. and ſo abaft the beam.

BEAM, in heraldry, the principal horn of a hart or buck.

BEAM, among hunters, the main ſtem of a deer's head, or that part which bears the antlers, royals, and tops.

BEAM, in mechanics, the lath, or iron, of a pair of ſcales.

BEAM is also the name of a fiery meteor, in the form of a pillar.

BEAM, or ROLLER, among weavers is a long and thick woollen cylinder, placed lengthwise on the back part of the loom of those who work with the shuttle. The threads of the warp are rolled upon the beam, and unrolls as the work proceeds.

BEAM-COMPASS, an instrument consisting of a square wooden or cross-beam, having sliding sockets that carry steel or pencil points; and used in describing large circles, where the common compasses are useless.

BEAM *of an Anchor*, the shank or longest part of an anchor. See ANCHOR.

BEAM *of a Plough*, a name given by our farmers to the largest piece of timber in a plough, and to which all the parts of the plough-tail are fixed.

This beam is generally made of ash, is straight, and eight feet long in the common plough; but in the four-coultered plough, it is ten feet long, and arched at the upper part. The head of this beam lies on the pillow of the plough, and is raised higher, or sunk lower, as that pillow is elevated or depressed by sliding along the crow-staves. Near the middle it has an iron collar, which receives the tow chain from the box; and the bridle-chain from the stake or gallows of the plough is fixed to it a little below the collar: some inches below this there is a hole, in which the coulter is fastened, and below that are two other small holes through which the heads of the retches, or irons that support both the sheat and the share, pass. Farther backward still is a large perforation, through which the body of the sheat passes; and behind that, very near the extremity, is another hole, through which the piece called the hinder sheat passes. See PLOUGH.

BEAN, *faba*, in botany, the name of a genus of plants whose flower is of the papilionaceous kind: the root is partly straight and partly creeping, with a quadrangular stalk that is light, and has several ribs: the conjugation of the leaves are not exact; for there has been sometimes three, four, five, or more of an oblong roundish shape, that are flat, and of a bluish green, venous, and smooth: the flowers proceed from the hollows where the ribs join to the stalk; and though several of them are together, they have but one pedicle: these are succeeded by a pod, so well known that it needs no description. There are several varieties of garden-beans, the most common of which are: 1. The Magazan, or Portugal-bean: 2. The Spanish: 3. The Sandwich: 4. The Toker: and 5. The Windsor-bean. The first sort should be planted in October or November, under walls, hedges, &c. and carefully earthed up as they grow: these, if not destroyed by severe weather, will be fit for table the beginning of May: though its bean is smaller than the other sorts, yet its hardiness, and coming in so early before the others, makes it deserve notice. The Spanish and Windsor beans, being more tender, should not be planted until after Christmas. The Sandwich is a plentiful bearer, and, being hardier than the Windsor, may be planted a month sooner. The Toker-bean comes about the same time as the Sandwich, and as it is a great bearer as well as that, it is now much planted. To have a succession of Windsor-beans, there should be several plantations made at the distance of about three weeks from the first sowing to the middle of May. The Magazan-beans may also be raised in beds, sowing them thick, and covered with hoops and matts in bad weather in the winter, and in spring planted out; though they will be later than those which have stood the winter abroad, yet, if they are cut off by the severity of the weather, the transplanted ones make a good supply in their stead. All the large sorts of beans should not be planted less than three feet asunder, row from row, and about seven or eight inches in the rows. The horse-bean delights in a strong moist soil, and an open exposure; the season for sowing them is from the latter end of February to the beginning of April, according to the nature of the soil. With regard to the nature and faculty of beans, the common opinion is, that they are windy and hard of digestion, and some doubt whether they nourish much or not. The meal of dried beans is reckoned among one of the four resolvent meals; and it is used by some as a cataplasm, boiled in milk, to resolve and suppurate tumours; the water distilled from the flowers is looked upon as a cosmetic, and is still in use to take away spots from the face.

BEAN *French*. See PHASEOLUS.

BEAN *Trefoil*. See CYTISUS.

BEAN-TREE, *Kidney*. See GLYCINE.

BEAR, *Ursa*, in zoology, a genus of quadrupeds, of the order of the *ferae*, or beasts of prey; distinguished by having only four teats, two on the breast, and two on the belly.

It is a large but unsightly animal, and of different sizes in different countries.

BEAR *Greater* and *Lesser*, in astronomy; see the articles URSA *Major* and *Minor*.

BEARBIND. See CONVOLVULUS.

BEAR'S-BREECH. See ACANTHUS.

BEAR'S-EAR. See AURICULA.

BEAR'S-FOOT. See HELLEBORUS.

BEARD *of a Comet*, in astronomy, the rays which the comet emits towards that part of the heavens whither it seems to direct its motion; and it is this that distinguishes the beard from the tail, which implies those rays that are emitted in the tract through which it has passed.

BEARD *of a Horse*, that part underneath the lower jaw, between the chin and the place where the curb rests.

BEARDED *Husk*, among florists, implies a husk that appears hairy on the edges; as that of a rose, &c.

BEARDING *of Wool*. See WOOL.

BEARER, in architecture, a post, pier, or wall, erected between the two ends of a piece of timber, to shorten its bearing, or to prevent its whole weight resting on the two ends only.

BEARER *of a Bill of Exchange*, the person in whose hands the bill is, in favour of whom the last order was made. See BILL *of Exchange*.

BEARING, in navigation, an arch of the horizon, comprehended between the nearest meridian and any distant object, either discovered by the eye, or found by the sinical proportion; as, at four P. M. we discovered Cape Malacha, bearing W. 64°. S. or, having the difference of latitude and longitude given, we find the bearing and distance by analogy.

BEARING *of a piece of Timber*, among carpenters, signifies the space either between its two fixed extremes, when it has no other support, which they call bearing at length, or between one extreme and a post, brick-wall, &c. trimmed up between the ends to shorten its bearing.

BEARING *Claws*, among cock-fighters, are the foremost toes of a cock. If these are hurt or gravelled, he cannot fight.

BEAR-UP, or BEAR-AWAY, in navigation, a ship is said to do so when, having sailed some time with a side-wind, she alters her course and sails more before it: this is probably called bearing-up, because the helm is borne up to the wind-side of the ship; for, otherwise, it is not only absurd, but an absolute contradiction to say a ship bears up when she goes before the wind, since the direction of the wind, as well as the current of the tide in a river, is understood to determine the situation of places within its limits; for we always say, up to the windward, and down to the leeward: and yet, absurd and contradictory as it is to common sense, this phrase is adopted in the instruction of our navy, in the room of bear-away or bear-down.

BEAST, a general appellation for all four-footed animals, whether proper for food, labour, or sport.

BEASTS *of Burden*, all four-footed animals used in carrying burdens. These are chiefly elephants, camels, dromedaries, horses, mules, asses, and the sheep of Mexico and Peru.

BEASTS *of Chace*, are the buck, the doe, the fox, the roe, and the martin.

BEASTS *and* FOWLS *of the Warren*, are the hare, the coney, the pheasant, and the partridge.

BEASTS *of the Forest*, are the hart, the hind, the boar, and the wolf.

BEATIFICATION, an act whereby the pope declares a person beatified or blessed. It is the first step towards canonization. See CANONIZATION.

BEATING, or PULSATION, in medicine, the reciprocal motion, or palpitation of the heart. See PULSE.

BEATING *Gold* and *Silver*. See GOLD-BEATING, &c.

BEATING, in navigation, the act of making a progress against the wind, by tacking. See the article TACKING. Beating, however, is generally understood to be turning to windward in a storm or fresh wind.

BEATS *of a Watch* or *Clock*, are the strokes made by the fangs or pallets of the spindle of the balance, or of the pads in a royal pendulum. See CLOCK and WATCH.

BEAVER, *Fiber*, in natural history, a creature about four feet in length, and twelve or fifteen inches broad. His skin, in the northern regions, is generally black, but it brightens into a reddish tincture in the temperate climates. He is covered with two sorts of hair, one long, and the other a soft down; the latter, which is an inch in length, is extremely fine and compact, and accommodates the animal with a necessary warmth. The long hair preserves the down from dirt and humidity.

The beaver, whether male or female, has four bags under his intestines, impregnated with a resinous and liquid substance, which, when it is ejected, settles into a thick consistence. See CASTOR.

His teeth are strong, and deeply riveted into his jaws, with a long and crooked root; with these he cuts as well the wood with which he builds, as that which furnishes him with food. His fore-feet resemble those of such animals as hold what they eat with their paws, as apes, for instance, and rats, and squirrels; with these feet he digs, softens, and works the clay, which is extremely serviceable to him. His hind feet are accommodated with membranes, or large skins, extending between his toes, like those of ducks and all other water-fowl; this makes it evident that the Author of nature intended the creature should be amphibious. His tail is long, a little flat, entirely covered with scales, supplied with muscles, and perpetually lubricated with oil or fat. This animal, who is an architect from his nativity, uses his tail instead of a hod, for the conveyance of his clay or mortar, and a trowel to spread and form it into an incrustation; the scales prevent these materials from penetrating the tail with their coldness and humidity; but would be injured by the air and water, were it not for the prevention of an oil, which he distributes all over them with his snout; the bags we have already mentioned are undoubtedly the magazines of this fluid.

Merchants distinguish three sorts of beavers,

though they are all the skins of the same animal: the new beaver, the dry beaver, and the coat beaver.

The new beaver, which is also called white beaver, or Muscovy beaver, because it is commonly kept to be sent into Muscovy, is that which the savages catch in their winter hunting. It is the best and the most proper for making fine furs, because it has lost none of its hair by shedding.

The dry beaver, which is sometimes called lean beaver, comes from the summer-hunting, which is the time when these animals lose part of their hair.

Though this sort of beaver be much inferior to the former, yet it may also be employed in furs; but it is chiefly used in the manufacture of hats. The French call it summer castor, or beaver.

The coat beaver is that which has contracted a certain gross and oily humour from the sweat which exhales from the bodies of the savages who wear it for some time. Though this sort be better than the dry beaver, yet it is used only in the making of hats.

Besides hats and furs, in which the beaver's hair is commonly used, they attempted in France, in the year 1699, to make other manufactures with it; and accordingly they made cloths, flannels, stockings, &c. partly of beaver's hair, and partly of Segovia wool. This manufactory, which was set up at Paris, in St. Anthony's suburb, succeeded at first pretty well; and, according to the genius of the French, the novelty of the thing brought into some repute the stuffs, stockings, gloves, and cloth, made of beaver's hair: but they went out of fashion of a sudden, because it was found, by experience, that they were of a very bad wear, and, besides, that the colours faded very much: when they had been wet, they became dry and hard, like felt, which occasioned the miscarriage of the manufactory for that time.

When the hair has been cut off from the beaver's skin, to be used in the manufactory of hats, those skins are still employed by several workmen; namely, by the trunk-makers, to cover trunks and boxes; by the shoe-makers, to put into slippers; and by turners, to make sieves for sifting grain and seeds.

BEAUTY, a general term for whatever excites in us pleasing sensations, or an idea of approbation.

We may therefore distinguish the notion annexed to beauty into ideas and sensations; the former of which possess the mind, the latter affect the heart. Thus an object may please the understanding, without interesting the senses; and, on the other hand, agreeable sensations may be excited by objects whose ideas have no claim to our approbation.

In these distinctions the difficulty, or rather impossibility, of fixing a general characteristic of beauty consists; because the ideas and sensations of different persons vary, according to their different turns of mind and habitudes of body: and consequently the relations of objects to those ideas and sensations vary in the same manner. Hence arise the various opinions of beauty in women, painting, statuary, &c.

BEAUTY, in architecture, painting, and other arts, is the harmony and justness of the whole composition taken together.

BECAH, or BEKAH, in antiquity, a Jewish coin, worth nearly fourteen-pence of our money.

BECALMING, in navigation. When the wind is interrupted in its passage to a vessel by any contiguous body, as land, a high sea behind, or another ship, it is called becalming her, as the sails at that time remain in a state of rest, and are deprived of their growing power.

BECA-BUNGA, in botany, the same with anagallis. See ANAGALLIS.

BECHICS, among physicians, medicines adapted to the cure of coughs.

The word is formed from the Greek, βηξ, βηχω, a cough.

BED *of the Carriage of a Cannon*, the thick plank that lies under the piece, and forming, as it were, the body of the carriage. See CANNON.

BED, in masonry, a course or range of stones.

BED, in gardening, a square or oblong piece of ground, raised a little above the level of the adjoining ground, and in which seeds are sown, or plants set.

Hot BED. See HOT-BED.

BEDS *of Minerals*, certain strata or layers of matter disposed over each other.

Lords of the BED-CHAMBER, in the British customs, ten lords, who attend in their turns each week; during which time they lie in the king's bed-chamber, and wait upon him when he dines in private.

BED-MOULDING is a term used by workmen, for those members in a cornice which are placed below the coronet, or crown, and usually consists of an ogee, list, large boultine, and under the coronet another list.

BEE, in natural history, a small insect, famous for its industry.

With respect to form, the bee is divided by two ligaments, into three parts or portions, the head, the breast, and the belly. The head is armed with two jaws and a trunk, the former of which play like two saws, opening and shutting to the right and left. The trunk is long and taper, and extremely pliant and flexible, being destined by nature for the insect to probe to the bottom of the flowers through all the impediments of their chives and foliage, and drain them of their treasured sweets: but were this trunk to be always extended, it would

would prove incommodious, and be liable to be injured by a thouſand accidents: it is therefore of ſuch a ſtructure, that, after the performance of its neceſſary functions, it may be contracted, or rather folded up; and beſides this, it is fortified againſt all injuries by four ſtrong ſcales, two of which cloſely ſheathe it, and the two others, whoſe cavities and dimenſions are larger, encompaſs the whole. From the middle part or breaſt of the bee grow the legs, which are ſix in number: and at the extremity of the paws are two little hooks, diſcernible by the microſcope, which appear like ſickles, with their points oppoſite to each other. The wings are four, two greater and two ſmaller, which not only ſerve to tranſport them through the air, but, by the noiſe they make, to give notice of their departure and arrival, and to animate them mutually to their ſeveral labours. The hairs with which the whole body is covered, are of ſingular uſe in retaining the ſmall duſt that falls from the chives of the flowers, of which the wax is formed, as will be obſerved hereafter. The belly of the bee conſiſts of ſix rings, which ſlide over one another, and may therefore be lengthened or contracted at pleaſure; and the inſide of this part of the body contains the inteſtines, the bag of honey, the bag of poiſon, and the ſting. The office of the inteſtines is the ſame as in other animals. The bag of honey is tranſparent as cryſtal, containing the ſweet juices extracted from flowers, which the bee diſcharges into the cells of the magazine for the ſupport of the community in winter. The bag of poiſon hangs at the root of the ſting, through the cavity of which, as through a pipe, the bee ejects ſome drops of this venomous liquor into the wound, and ſo renders the pain more exceſſive. The mechaniſm of the ſting is admirable, being compoſed of two darts, incloſed within a ſheath that tapers into a fine point, near which is an opening to let out the poiſon. The two darts are ejected through another aperture, which, being armed with ſeveral ſharp beards like thoſe of fiſh-hooks, are not eaſily drawn back again by the bee; and indeed ſhe never diſengages them if the wounded party happens to ſtart and put her into confuſion; but if one can have patience to continue calm and unmoved, ſhe clinches thoſe lateral points round the ſhaft of the dart, by which means ſhe recovers her weapon, and gives leſs pain to the perſon ſtung. The liquor which at the ſame time ſhe infuſes into the wound, cauſes a fermentation, attended with a ſwelling, which continues ſeveral days; but that may be prevented by immediately pulling out the ſting, and enlarging the puncture, to let the venomous matter have room to eſcape.

Let us now conſider the generation, polity, and labours of theſe inſects, the true knowledge of which is very much owing to the modern invention of glaſs-hives, through which all the ſecrets of the community are laid open to a curious obſerver. Any perſon who carefully examines a hive at different ſeaſons of the year, will diſtinguiſh three ſorts of bees; of which the far greater number are the common working bees, who do all the buſineſs of the hive, and ſeem to be neither male nor female. The working bee is repreſented at C (Plate XX. *fig.* 1.) The ſecond ſort, called drones, are the males, are ſomewhat larger, (as A, *fig.* 2.) have no ſting, nor even ſtir from the hive, but live upon the honey prepared by the others. The third ſort is a much larger and longer-bodied bee, of which there is often but one in a hive, at leaſt, but one in every ſwarm or colony of young bees, who are from time to time detached from the hive in ſearch of another habitation. This large bee is what the ancients called the king, from the reſpect they always ſaw paid to it by the other bees; but, being the female, the moderns more properly give it the title of queen, or mother of the ſwarm. See Plate XX. *fig.* 2. B.

While the hive is ſufficient to contain the bees without inconvenience, the ſociety live peaceably together; but when their numbers are multiplied, ſo that their habitation is too ſmall, the young brood quit the place of their nativity, and fly in queſt of a new ſettlement. The ſwarm that goes out conſiſts of the common bees, under the conduct of one female or queen; or, if two queens come out of the ſame hive, then the body of common bees divides into two parts, each following one female: both parties, however, when they alight out of the air, uſually ſettle near each other on a branch of a tree; and then thoſe bees which form the ſmalleſt ſwarm go off, one by one, to the other cluſter, deſerting the queen they followed, who is at length murdered by her ſubjects. The ſwarm being thus united, and hanging down from the tree, the countryman, who is always vigilant on thoſe occaſions, provides for their accommodation a hive rubbed with balm, thyme, and other odoriferous herbs, into which he gently bruſhes them from the branch, and carries them to a ſtand prepared for that purpoſe. All this the bees bear very patiently, and, after they are a little compoſed, begin to think of forming themſelves convenient apartments in their new habitation.

When they begin this work, it is obſerved they divide themſelves into four parties, one of which is deſtined to the fields to provide materials for the ſtructure; the ſecond works upon thoſe materials, and forms them into a rough ſketch of the dimenſions and partitions of the cells; the third examines and adjuſts the angles, removes the ſuperfluous wax, poliſhes the work, and gives it its neceſſary perfection; and the fourth is employed in bringing proviſions to the labourers.

M. Maraldi takes notice that the bees employed in poliſhing the combs, work longer than thoſe that

that build them, becauſe poliſhing is not ſo laborious. They begin their work at the top of the hive, continuing downwards to the bottom, and from one ſide to another; and to make it the more ſolid they uſe a ſort of tempered wax, reſembling glue. The form of the cells of the honey-comb is hexagonal, which figure, beſides what is common with a ſquare and equilateral triangle, has the advantage of including a greater ſpace within the ſame ſurface. See the article COMB.

The expedition of the bees in their labour is almoſt incredible; for, notwithſtanding the elegance and juſt proportions of the work, they are ſo indefatigable, that they will, in one day, finiſh a honey-comb, a foot long, and ſix inches broad, capable of receiving three thouſand bees.

It is not eaſy to know, particularly, the manner in which they employ themſelves at this work, on account of the number of bees then in motion, by which means the eye can hardly diſtinguiſh any thing but confuſion. We have however been able to obſerve the following particulars: Some bees, bearing in each of their talons a little piece of wax, are ſeen running to the places where their companions are at work upon the combs; at their arrival they faſten the wax to the work by means of the ſame talons, which they apply ſometimes to the right, and ſometimes to the left. Each bee is employed but a ſhort time on this work, when another takes its place.

While a part of the bees are at work in conſtructing the cells, others are employed in perfecting thoſe that are newly modelled, finiſhing the angles, ſides, and baſes, in ſo exquiſite a manner, and with ſuch remarkable delicacy, that three or four of theſe ſides laid upon one another, are not thicker than a leaf of common paper; and becauſe the entrance of the cell, which is adapted to the ſize of the bee, would, on account of this delicacy, be ſubject to break, they ſtrengthen the entrance of each cell with a border of wax.

We have already obſerved, that the bees which build the cells work but a little while at a time; but it is different with regard to thoſe that poliſh them, for they work a long while, and with great expedition, never intermitting their labour, unleſs it be to carry out of the cell the particles of wax taken off in the poliſhing: and, to prevent this wax from being loſt, other bees ſtand ready to receive it from the poliſhers, and carry it to ſome other part in order to its being employed.

Each comb has two rows of cells oppoſite to each other, which have their common baſes. The thickneſs of each comb is ſomething leſs than an inch; and, conſequently, the depth of each cell about five lines; but at the ſame time the breadth of each is little more than two.

All the combs are conſtructed with cells of this ſize, except a ſmall number of others in ſome particular parts of the hive, which are larger, and appropriated to the lodging eggs, that afterwards become drones, or male bees.

There are alſo, in ſome parts of the hive, three or four cells bigger than the others, and conſtructed in a different manner. They are of a ſpheroidical figure, open in the inferior part, and attached to the extremities of the combs.

When the cells are completed, the queen takes poſſeſſion of thoſe ſhe likes beſt to depoſite her eggs in, and the reſt are left to be filled with honey. She lays one egg in each cell, and ſometimes more than an hundred of thoſe eggs in a day; but what is ſtill more remarkable, ſhe lays thoſe eggs which are to produce common bees in cells of the common ſhape and ſize, thoſe that are to become drones or males, in the cells of a larger ſize, and depoſites thoſe which are to become females, like herſelf, in the ſpheroidical cells already deſcribed.

Theſe eggs, after lying ſome time in the cells, are hatched into maggots, and fed with honey ten or twelve days, after which the other bees cloſe up the cells with a thin piece of wax; and under this covering they become gradually transformed into bees, in the ſame manner as ſilk-worms are into butterflies. Having undergone this change, the young bees pierce through their waxen doors, wipe off the humidity from their little wings, take their flight into the fields, rob the flowers of their ſweets, and are perfectly acquainted with every neceſſary circumſtance of their future conduct. As to the males or drones, which are deſtined only to propagate their ſpecies, they live very comfortably for about three months after they are hatched; but when that time is over, and the females are impregnated, the common bees either kill them, or drive them from the hive, as burdenſome to the community, and not a drone is to be found till the next ſeaſon.

The method in which the bees collect their wax and honey deſerves to be a little explained. At the bottom of all flowers there are certain glands which contain more or leſs honey, that is, the moſt exalted particles of the ſugary juices of the plant. Theſe juices the bee ſucks up with her proboſcis or trunk abovementioned, and draws it into its mouth; and when it has thus taken a ſufficient quantity into its ſtomach, it returns to the hive, and diſcharges the honey into the common magazine.

When the cells prepared to receive it are full, the bees cloſe up ſome with wax till they have occaſion for the honey; the reſt they leave open, to which all the members of the ſociety reſort, and take their repaſt with a very inſtructive moderation.

It is an excellent obſervation of a modern author, that the hive is a ſchool to which numbers of people ought to be ſent; prudence, induſtry, benevolence, public ſpiritedneſs, œconomy, neatneſs, and temperance, are all viſible among the bees.

These little animals are actuated by a social spirit, which forms them into a body politic, intimately united, and perfectly happy. They all labour for the general advantage; they are all submissive to the laws and regulations of the community: having no particular interest, no distinction but those which nature or the necessities of their young have introduced amongst them. We never see them dissatisfied with their condition, or inclinable to abandon the hive in disgust, to find themselves slaves or necessitous: on the contrary, they think themselves in perfect freedom and perfect affluence; and such indeed is their real condition. They are free, because they only depend on the laws; they are happy, because the concurrence of their several labours inevitably produces abundance, which contributes to the riches of each individual. Let us compare human societies with this, and they will appear altogether monstrous. Necessity, reason, and philosophy, have established them for the commendable purposes of mutual aid and benefits: but a spirit of selfishness destroys all; and one half of mankind, to load themselves with superfluities, leave the other destitute of common necessaries.

Wax is composed of the farina, or dust, formed on the apices of flowers. This the bees collect, and with their fore-feet and jaws, roll up into little balls, which they convey, one at a time, to the feet of their middle legs, and from thence to the middle joint of their hind legs, where there is a small cavity like a spoon, to receive the burden. When those bees, who are employed in collecting the wax, return to the hive, they are assisted by their companions in discharging their load, who by little and little pick off the wax from their legs, and convey it to the common treasure. With this they build their combs, observing a wonderful frugality, not the least grain of it being wasted or neglected.

Considering the advantages arising from the labours of bees, is it not strange that our countrypeople are not more sollicitous about the preservation and increase of these animals? It is certain they would multiply prodigiously with proper management; and we might, upon a moderate computation, have five thousand times as much wax and honey produced in this kingdom as we have at present. Some attempts of this kind have already been made in our own country, and there is not the least reason to doubt but they will, if pursued, be attended with success. The first method we shall mention of this kind is that of the Rev. Mr. Stephen White, which he calls collateral bee-boxes; an invention by which part of the honey and wax may be taken without injuring the bees.

Manner of constructing a single BEE-BOX.—It may be made of deal, or any other boards, well seasoned, that are not apt to warp or split. The boards should be near an inch thick: let it be eight inches and a half in height and breadth, every way, measuring within, and including the space the thin boards take up at the ends, as if there were no such boards: with these dimensions it will contain about a peck and one pint. The box is in figure four square. The front part must have a door cut in the middle of the bottom edge, about four inches wide, and half an inch in height, which will give free liberty to the bees to pass through, yet not be large enough for their enemy, the mouse, to enter. In the back part you must cut a hole with a rabbet in it, in which you are to fix a pane of the cleerest and best crown-glass, about five inches in length, and three in breadth, and fasten it with putty. Let the top of the glass be placed as high as the roof within-side, that you may see the upper part of the combs, where the bees with their riches are mostly placed. You will, by that means, be better able to judge of their state and strength, than if your glass was fixed in the middle. Such as are desirous of seeing more of the bees works, may make the glass as large as the box will admit, without weakening it too much; which may be prevented by nailing a little slip of board cross the bottom. The glass must be covered with a thin piece of board, by way of shutter, which may be made to hang over the glass, by a piece of tape going through the upper part of the shutter, and fastened on the top of the box, by thrusting both ends into a gimlet hole; and after driving a peg pretty hard into the hole, you may cut off the peg close to the box.

As for the two other sides of the box, which, for distinction sake, may be called the ends, they are not to be wholly enclosed. A space is to be left in each end, near an inch wide at the top, and another space more than an inch wide at the bottom; which spaces are to be extended in length the whole breadth of the box. Through these, the bees are to have a communication from one box to another. To form these communications, a thin piece of slit deal must be let into the edges of the front and the back boards, so as to be flush with the edges of those boards.

In the next place you are to provide a piece of slit deal, full half an inch thick, and large enough to cover one of the ends, but to be used indifferently, sometimes at one end, and sometimes at the other; for which reason it is not to be nailed, but tied on, in the following manner, viz. Take about three quarters of a yard of pretty strong tape, which will be found better than packthread, because it is less apt to relax and slacken. Fix one end of the tape in the front board, about six inches above the mouth, and directly over the middle of it. Let this end of the tape be fastened in a gimlet-hole, with a peg drove hard in, and then cut off close to the board, as was directed for the shutter. You are next to bore a hole on each side of your glass, fix

fix inches and a half from the bottom of the box: into each of these holes drive a peg, which may ſtand out more than an inch from the box. Let the pegs be made of aſh, which is a tough wood, and let one end of them be flat, that you may ſcrew them out or in the more conveniently. When this is done, take your looſe end-board, and ſet it in its proper place, ſo that it may cover one of the ends, it matters not which: then drawing your tape as tight as you can over it, faſten the end of it to one of the pegs by the ſide of the glaſs. This will confine your end-board, and keep the upper part of it cloſe to the box: and if the lower part ſhould gape a little, or ſtart from the box, you may keep it tight by a nail or two drove ſo gently into the ſtool, on which the box is placed, that you may, whenever you have occaſion, draw them out with your fingers; or, if you like it better, you may add another tape, with pegs as before, to go croſs the lower part of the end-board.

The gimlet holes need not be carried quite through the board, and it is better they ſhould not; for if any part of the ſtring appears within the box, it will give offence to the bees, and coſt them a great deal of pains to pull it to pieces.

You have now only to fix a ſtick, croſſing the box from end to end, about three inches from the bottom, to be a ſtay to the combs: and when you have painted the whole, to make it more durable, your box is finiſhed.

The judicious bee-maſter will here obſerve, that the form of the box is as plain as it is poſſible for it to be. It is little more than three ſquare pieces of board nailed together: ſo that a poor cottager, who has but ingenuity enough to ſaw a board into given dimenſions, to ſquare it exactly, and to drive a nail, may make his own boxes well enough, without the help or the expence of a carpenter. See Plate XX. *fig.* 3. where D is the front of a ſingle box, E the back, and F the end.

Having thus conſtructed the boxes, it will in the next place be neceſſary to deſcribe the method of driving a ſwarm into them. In order to this, you are to take a box, with one end-board tied to it (as before directed) on your right hand, and another box, with the end-board tied to it on your left hand; ſet theſe together, leaving the communications open from one box to another: then tie the boxes together as faſt as you can, with a ſtring going five or ſix times round them. The boxes ſhould not be tied till you are juſt going to uſe them, becauſe the ſtring will grow ſlack with ſtanding, and then the boxes will be apt to ſlip one from the other, as you handle them.

Be careful to tie the ſhutters cloſe to the glaſs, that the light may not enter: for the bees ſeem to look upon the light as a hole or breach in their houſe, and, on that account, may not ſo well like their new habitation. But the principal thing to be obſerved, at this time, is to cover the boxes, as ſoon as ever the bees are hived, with a linen cloth thrown looſely over them; and it may be proper alſo to lay ſome green boughs upon them to protect them from the piercing heat of the ſun. Boxes will admit the heat much ſooner than ſtraw-hives; and if the bees find their houſe too hot, they will be wiſe enough to leave it. In all other reſpects, they are to be hived in boxes, after the ſame manner as in common hives, which being well known, no particular directions need be given concerning it.

When the bees are thus hived in two boxes, and placed in the evening where they are to remain, the ſtring which tied the two boxes together may be taken off, and the ſhutter of your glaſs being at liberty, obſerve which of the boxes the bees have made choice of for their preſent reſidence, and ſtop the mouth of that box with a ſlip of board, ſo that they may work only out of the empty box; for they will fill the former with their works before they begin in the latter. When you find they have begun in the ſecond box, it will be proper to give them a third, which is done in this manner. Take a thin knife, and cut through the reſinous ſubſtance, with which the bees will now have joined the end-board to the box; then looſening the tape that ties the board, thruſt gently a ſheet of double tin between the box and the end-board, taking away the latter, and placing an empty box in the room of it: this done, draw away the tin with a gentle hand, and thruſt the new box cloſe to the other. You muſt alſo remember that the mouth of this third box muſt be ſtopped like the firſt, that the entrance may be only in the ſecond or middle box. See Plate XX. *fig.* 3. where G,G,G, are three boxes joined together. H the tape which ties the end-boards, I the tin ſtopping the communication.

About the middle of Auguſt, you will eaſily diſcover through your glaſſes, which of your colonies you may lay under contribution. Such as have filled three boxes will readily yield you one of them: and it will be beſt to take the box where there are feweſt bees, becauſe the queen-bee is not likely to be there. The moſt proper time is about three or four o'clock in the afternoon; when the operation may be eaſily performed in the following manner: Open the mouth of the box you are going to ſeize; or, which may be better, that half of it which is furtheſt from the middle box: then, with a thin knife, cut through the reſin with which the bees have joined this box to the middle one, till you find you have ſeparated them; after which thruſt your ſheet of tin gently between the boxes, and your work is done. The communication being thus ſtopped, the bees in the two boxes, where in all probability the queen is, will be a little diſturbed at the operation, but thoſe in the

ſingle

ſingle box will appear diſtracted. They ſoon become ſenſible that their ſovereign is not among them; and accordingly iſſue out at the new door in a viſible rage and diſorder: but this is quickly over; for they ſoon diſcover their companions, and fly to them with eager haſte, at the uſual mouth of the middle box, forgetting, in the midſt of their tranſports, the loſs of the riches they have left behind them. You may now carry off the prize without moleſtation, placing an end-board in the room of the box you have taken, drawing away your tin, and faſtening the board with tape, as before directed. See Plate XX. *fig.* 3. where K repreſents the hole half open, and the bees iſſuing out of the box to be taken away.

By this method, large quantities of wax and honey may be collected, without deſtroying the bees, while your ſtock will be every year increaſed by ſwarms, and all your colonies well ſtocked with bees.

Another invention for ſaving the lives of bees, and increaſing the quantity of wax and honey, has very lately been laid before the Society for the Encouragement of Arts, &c. by Mr. Thorley, and obtained their approbation.

Deſcription of Mr. Thorley's BEE-HIVE.——This ingenious and aſſiduous gentleman, having, from near ſixty years experience, found that his bee-hives would be productive of much greater profit to the owners of bees, and alſo render that cruel and ungenerous practice of deſtroying theſe animals not only unneceſſary, but pernicious, preſented a bee-hive of this conſtruction to the Society of Arts, &c. in the Strand, who readily purchaſed another of his hives filled with honey, &c. that they might be inſpected by the curious, and brought into univerſal uſe; and from this bee-hive the view on Plate XX. *fig.* 4. was drawn. The Society, perſuaded that the invention would prove of the greateſt advantage to this country, have publiſhed a premium of two hundred pounds, in order to introduce either Mr. Thorley's, or ſome other method of a ſimilar kind, whereby much larger quantities of honey and wax might be procured, and, at the ſame time, the lives of theſe laborious and uſeful inſects preſerved.

The bottom part, marked A, is an octangular bee-box, made of deal boards, about an inch in thickneſs, the cover of which is about 17 inches in diameter, but the internal part only $15\frac{1}{2}$, and its height ten inches. In the middle of the cover of this octangular box is a hole, which may be opened or ſhut at pleaſure, by means of a ſlider *d*. In one of the pannels is a pane of glaſs, covered with a wooden door, *b*. The entrance, *a*, at the bottom of the box is about three inches and a half broad, and half an inch high. Two ſlips of deal, about half an inch ſquare, croſs each other in the center of the box, and are faſtened to the pannels by means of ſmall ſcrews. To theſe ſlips the bees faſten their combs.

In this octangular box the bees are hived, after ſwarming in the uſual manner, and there ſuffered to continue till they have built their combs, and filled them with honey, which may be known from opening the door, and viewing their works through the glaſs pane, or by the weight of the hive. When the bee-maſter finds his laborious inſects have filled their habitation, he is to place a common bee-hive of ſtraw, repreſented at B, made either flat at the top, or in the common form, on the octangular box, and draw out the ſlider, by which a communication will be opened between the box and the ſtraw hive; the conſequence of which will be, that thoſe laborious inſects will fill this hive alſo with the product of their labours. When the bee-maſter finds the ſtraw hive is well filled, he may puſh in the ſlider, and take it away, placing another immediately in its room, and then drawing out the ſlider. Theſe indefatigable creatures will then fill the new hive in the ſame manner. By proceeding in this method, Mr. Thorley aſſured the Society that he had taken three ſucceſſive hives, filled with honey and wax, from one ſingle hive, during the ſame ſummer; and that after he had laid his inſects under ſo large a contribution, the food ſtill remaining in the octangular box was abundantly ſufficient for their ſupport during the winter. He added, that if this method was purſued in every part of the kingdom, inſtead of that cruel method of putting the creatures to death, he was perſuaded from long experience, that wax would be collected in ſuch plenty that candles might be made with it, and ſold as cheap as thoſe of tallow are at preſent.

Mr. Thorley has alſo added another part to his bee-hive, which cannot fail of affording the higheſt entertainment to a curious and inquiſitive mind. It conſiſts of a glaſs receiver, repreſented at D, 18 inches in height, 8 inches in diameter at the bottom, and in the greateſt part 13. This receiver has a hole at the top, about an inch in diameter, through which a ſquare piece of deal E is extended to nearly the bottom of the veſſel, having two croſs bars to which the bees faſten their combs. When the bees have filled their ſtraw hive, (which muſt have a hole in the center C, covered with a piece of tin) Mr. Thorley places the glaſs-receiver upon the top of the ſtraw hive, and draws out the piece of tin: the bees, now finding their habitation enlarged, purſue their labours with ſuch alacrity, that they fill this glaſs hive likewiſe with their ſtores. And as this receptacle is wholly tranſparent, the curious obſerver may entertain himſelf with viewing the whole progreſs of their works. One of the hives, now depoſited at the Society's rooms in the Strand, is filled with the produce of the labours of thoſe inſects; and the glaſs-hive is ſuppoſed to

contain

contain near thirty pounds of honey. See a further account of managing these useful creatures, and the nature of their productions, under the articles SWARM, HIVE, HONEY, WAX, &c.

BEE-BREAD, a substance found in the cells of bees, and which is thought necessary to their subsistence. It is nothing more than wax itself unprepared.

BEECH, *Fagus*, in botany, an amentaceous tree, producing male and female flowers. The male flowers are apetalous, composed of an empalement of one leaf, containing several stamina, and are collected into globular heads: the female flowers are also destitute of petals, but consist of a single calyx, which contains a germen, which afterwards becomes a roundish capsule, opening in three cells containing in each a triangular nut.

There is but one species of this tree at present known, (except two varieties with striped leaves, which are accidental) and a beech which grows in North America; but the plants which have arisen from the seeds thereof, are no way distinguishable from the common sort.

This tree is propagated from its seed, (called mast) which must be gathered about the latter end of September, or beginning of October, at which time it is ripe and begins to fall; and is the proper and most natural season for sowing them, though it may be done any where between the time of gathering and the month of February. A small spot of ground will be sufficient to raise a great number of trees from seeds; the beds must be kept clear of weeds, and managed as the ash. See ASH.

This tree will grow to a considerable stature, though the soil be stoney and barren; as also, upon the declivities of hills and chalky mountains, where they will resist the winds better than most other trees; but then the nurseries for the young plants ought to be one and the same sort of soil, for if they are raised in a good soil, and a warm exposure, and afterwards transplanted into a bleak barren situation, they seldom thrive, which is the case in most other trees.

The beech is very proper to form large hedges, to surround plantations, &c. and may be kept in a regular form by clipping twice a year, especially if they shoot strong. The shade of this tree is very injurious to most sort of plants, which grow near it, but is generally believed to be very salubrious to human bodies.

This timber is of great use to turners for making trenchers, dishes, trays, buckets, and likewise to joiners for bedsteads, stools, planes, &c. also for making rims of wheels for corn-mills, water-engines, and divers other purposes. The mast, or fruit of the beech-tree, is very good to fat swine or deer; it also affords a sweet oil.

BEECH-MAST, the fruit of the beech-tree, excellent for the fattening of hogs, &c.

BEER, a common and well known liquor, made with malt and hops, and used in those parts of Europe where vines will not grow, and where cyder is scarce. See the articles MALT, BREWING, &c.

It is chiefly distinguished from ale by the quantity of hops, which is greater in beer, and thereby renders the liquor bitterer, and fitter to keep.

There are various differences in beers, proceeding from the ways of brewing, from the different countries or climates, from the water that is used, from the time spent about them, from the ingredients made use of, and the proportions of these ingredients.

That beer is reckoned the best which is clear, and of a pale colour, of a pungent and agreeable taste, that sparkles upon being poured into a glass, and is neither too old nor too new.

Aigre BEER is used by callico-printers, chemists, lapidaries, scarlet-dyers, vinegar-merchants, and white-leadmen.

BEER, among weavers, a term that signifies nineteen ends of yarn, running all together the whole length of the cloth.

BEER-MEASURE. See MEASURE.

BEESTINGS, a term used by country people for the first milk taken from a cow after calving.

BEET, *Beta*, in botany. See BETA.

BEETLE, *Scarabæus*, in the history of insects. See the article SCARABÆUS.

BEETLE also denotes a wooden instrument for driving piles, &c.

It is likewise called a stamper; and by paviors a rammer.

BEGHARDI, *Beguardi*, a certain sect of heretics, which arose in Germany, and in the Low-Countries, about the end of the thirteenth century. They made profession of monastical life, without observing celibacy; and maintained, if they are not scandalized by the monks, that man could become as perfect in this life as he shall be in heaven; that every intellectual nature is of itself happy, without the succour of grace; and that he who is in this state of perfection ought to perform no good works, nor worship the host.

BEGLERBEG, a governor of one of the principal governments in the Turkish empire. There are two sorts of beglerbegs; the one have a certain revenue assigned upon the cities, boroughs, and villages of their government, which they raise by power of the commission granted to them by the sultan; the others have a certain rent paid by the treasurer of the grand seignior. They are become almost independent, and have under their jurisdiction several sangiacs, or particular governments, and beys, agas, and other officers who obey them.

BEGUINS, congregations of devout young women, who maintain themſelves by the work of their hands, leading a middle kind of life between the ſecular and religious. Theſe ſocieties conſiſt of ſeveral houſes placed together in one incloſure, with one or more churches, according to the number of beguins.

There is in every houſe a prioreſs, without whoſe leave they cannot ſtir out. Their vow is conceived in theſe terms: "I promiſe to be obedient "and chaſte, as long as I continue in this be-"guinage." They obſerve a three years noviciate, before they take the habit, and the rector of the pariſh is the ſuperior, but can do nothing without the advice of eight beguins.

They are eſtabliſhed in ſeveral parts of Flanders.

BEHEN, in pharmacy, a name appropriated to two roots, very different from one another in ſhade, colour, and their whole external appearance, and diſtinguiſhed by the names of white and red behen.

We have them both from the Levant, and they ſeem to be produced in many parts of the Eaſt; but no where in ſuch plenty as about the foot of Mount Lebanon.

The ſame virtues are attributed to both kinds of behen, but the white is ſuppoſed to poſſeſs them in the greateſt degree; they are ſaid to be great cordials and reſtoratives, and to be good in nervous complaints.

BEIRAM, or BAIRAM, a Turkiſh word which ſignifies a ſolemn feaſt. The Turks celebrate two beirams: the greater, which falls on the tenth day of the laſt month of the Arabic year, which is the month of pilgrimage; and the leſſer, which ends the feaſt of the month Rammadan, and falls on the firſt day of the month Scheval. This latter is celebrated at Conſtantinople, and elſewhere, with great rejoicings, becauſe it puts an end to their faſting; and for this reaſon it is vulgarly called the Eaſter of the Turks.

BEL, or BELUS, the ſupreme god of the ancient Chaldeans or Babylonians. He was the founder of the Babylonian empire, and is ſuppoſed to be the Nimrod of Scripture, and the ſame as the Phœnician Baal.

This god had a temple erected to him in the city of Babylon, on the very uppermoſt range of the famous tower of Babel, or Babylon, wherein were many ſtatues of this deity, and one, among the reſt, of maſſy gold, forty feet high. The whole furniture of this magnificent temple was of the ſame metal, and valued at eight hundred talents of gold.

This temple, with its riches, was in being till the time of Xerxes, who, returning from his unfortunate expedition into Egypt, demoliſhed it, and carried off the immenſe wealth contained in it.

It was the ſtatue of this god which Nebuchadnezzar, being returned to Babylon, after the end of the Jewiſh war, ſet up, and dedicated in the plain of Dura; the ſtory of which is related at large in the third chapter of Daniel.

BEL *and the* DRAGON, the hiſtory of, an apocryphal, and uncanonical, book of Scripture. It was always rejected by the Jewiſh church, and is extant neither in the Hebrew nor the Chaldee language; nor is there any proof that it ever was ſo. St. Jerom gives it no better title than the Fable of Bel and the Dragon. It is however permitted to be read, as well as the other apocryphal writings, for the inſtruction and improvement of manners.

BELATUCADRUS, or BELLOTUCADRUS, a deity of the ancient Britons, particularly the Brigantes, or inhabitants of Cumberland.

He appears to have been the ſame as Mars; and it is probable the name might be taken from Bel, or Baal, the great idol of the Aſſyrians, which, according to Cedrenus, was the ſame as Mars.

BELAYING, amongſt ſeamen, faſtening a ſmall rope; as there are other phraſes appropriated to larger ropes, as bend, bit, ſtopper, &c.

BELEMNITES, in natural hiſtory, a kind of foſſil ſubſtance, with regard to whoſe origin naturaliſts are divided. It is generally called the thunder-bolt. See Plate XVII. *fig.* 5.

The word is formed from the Greek, βελεμνον, a dart.

The ſhape of the belemnites is ſometimes conical, ſometimes cylindrical, and commonly conſiſts of a black and horny ſubſtance. The inward parts conſiſt of rays, and there is generally a cell at the large end, and a furrow that runs from the top to the bottom. Dr. Plott informs us, that when the belemnitæ are rubbed againſt each other, or are ſcraped with a knife, they have the ſmell of raſped horn, and that their texture conſiſts of ſmall threads running like rays from the centre, or rather from the axis of the ſtone to the ſurface: when burned they have likewiſe a ſmell like that of horn; and the greateſt he found was ſomewhat above four inches in length, and about an inch and a quarter in thickneſs.

They are found in all ſorts of ſtrata, in clay, gravel, beds of ſtone, and often in looſe flints. They are ſometimes found covered with a ſparry cruſt of a different texture from the body of the maſs.

BELENUS, the tutelar deity of the ancient inhabitants of Aquileia in Italy, of the Gauls, and of the Illyrians. He was the ſame as Apollo, or the Sun; as we learn from Julius Capitolinus, who relates, that when Maximinius in vain beſieged Aquileia, he ſent ambaſſadors into the town, who had

had almoſt perſuaded the people to ſurrender, had not Menophilus and his colleague oppoſed it, telling them, that the god Belenus had promiſed them the victory over Maximinius. The hiſtorian adds, that the ſoldiers of Maximinius afterwards gave out, that Apollo fought againſt them.

BELIEF, in a general and natural ſenſe, ſignifies a perſuaſion or ſtrong aſſent of the mind to any propoſition; but, in a more reſtrained and technical ſenſe, it imports that kind of aſſent which is founded on the authority or teſtimony of ſome perſons atteſting the truth of any matter propoſed.

BELIEF is generally diſtinguiſhed into divine and human, not with regard to the propoſition believed, but with regard to the teſtimony on which we believe it. When God reveals any thing to us, this gives us the teſtimony of divine belief. See the article FAITH.

But what man only acquaints us with, produces only a human belief. See the article EVIDENCE.

BELL, a well known machine, ranked by muſicians among the muſical inſtruments of percuſſion.

The metal of which a bell is made, is a compoſition of tin and copper, or pewter and copper: the proportion one to the other is about twenty pounds of pewter, or twenty-three pounds of tin to one hundred weight of copper.

The ſound of a bell conſiſts in a vibratory motion of its parts, much like that of a muſical chord. The ſtroke of the clapper muſt neceſſarily change the figure of the bell, and of a round make it oval; but the metal having a great degree of elaſticity, that part will return back again which the ſtroke drove fartheſt off from the center, and that even ſome ſmall matter nearer the center than before; ſo that the two parts which before were extremes of the longeſt diameter, do then become thoſe of the ſhorteſt: and thus the external ſurface of the bell undergoes alternate changes of figure, and by that means gives that tremulous motion to the air in which the ſound conſiſts.

Diving BELL. See the article DIVING.

BELL-FOUNDERY. See FOUNDERY.

BELL-FLOWER, *Campanula*, in botany; ſee the article CAMPANULA.

BELLA-DONNA, in botany, a genus of the pentandria monogynia claſs of plants, called by Linnæus atropa. See ATROPA.

BELLING *of Hops* denotes their opening and expanding themſelves. See HOPS.

BELLIS, DAISY, in botany. See DAISY.

BELLON, a diſtemper common in countries where they ſmelt lead ore; as alſo among plumbers and painters.

It is attended with languor, intolerable pains and ſenſation of gripings in the belly, and generally coſtiveneſs.

Beaſts, poultry, &c. as well as men, are ſubject to this diſorder: hence a certain ſpace round the ſmelting houſes is called bellon-ground, becauſe it is dangerous for an animal to feed upon it.

BELLONA, the pagan goddeſs of war. She is joined by Homer with Mars, the god of war.

Bellona is called by the Greeks Ἐνυώ, Enyo. Some make her the mother, others the ſiſter, and others the wife of Mars, who is ſtiled Enyalius upon one or other of thoſe accounts. Heſiod ſays, ſhe was the daughter of Phorcys and Ceto.

As the ſun, among other names, is ſuppoſed to have been worſhipped under that of Mars, ſo it is probable Bellona repreſented the moon.

BELLONARII, in Roman antiquity, the prieſts of Bellona, who, in honour of that goddeſs, uſed to make inciſions in their body; and, after having gathered the blood in the palm of their hand, gave it to thoſe who were partakers of their myſteries.

BELLONIA, in botany, a pentandrious plant common in ſeveral parts of the American iſlands; it hath a woody ſtem, which riſes ten or twelve feet high, ſending out many lateral branches, which are garniſhed with oval rough leaves, placed oppoſite: the flowers come out from the wings of the leaves in looſe panicles: theſe are wheel-ſhaped, of one plate, and divided into five parts; the germen is ſituated under the receptacle of the flower, and is ſucceeded by an oval capſule ending in a point, which is full of ſmall round ſeeds. This plant is propagated by ſeeds; but, being a native of the hot countries, it requires a ſtove in this climate to preſerve it.

BELLOWING, among ſportſmen, denotes the noiſe of roes in rutting-time.

BELLOWS, a machine ſo contrived as to agitate the air with great briſkneſs, expiring and inſpiring the air by turns, and that only from enlarging and contracting its capacity.

BELLY, in anatomy, the ſame with what is more uſually called abdomen, or rather the cavity of the abdomen. See the article ABDOMEN.

BELOMANCY, a ſort of divination by means of arrows, practiſed in the Eaſt, and particularly in Arabia.

Belomancy has been performed different ways, whereof one was this: ſuppoſe a parcel of arrows, eleven or more of them, being put into a bag; theſe were afterwards drawn out, and according as they were marked or not, they judged of future events.

BELT, *Balteus*, in the military art, a leathern girdle for ſuſtaining the arms, &c. of a ſoldier.

BELTS, in aſtronomy, two zones, or girdles, ſurrounding the body of the planet of Jupiter, more lucid than the reſt, and of unequal breadth. See JUPITER.

BELVIDERE, in the Italian architecture, &c. denotes

denotes either a pavilion on the top of a building, or an artificial eminence in a garden; the word literally ſignifying a fine proſpect.

BEN, Been, or Behen. See Behen.

BENCH, or Banc, in law; ſee Banc.

Free Bench ſignifies that eſtate in copyhold lands, which the wife, being eſpouſed a virgin, has after the deceaſe of her huſband for her dower, according to the cuſtom of the manor. As to this free-bench, ſeveral manors have ſeveral cuſtoms; and in the manors of Eaſt and Weſt Enbourne, in the county of Berks, and other parts of England, there is a cuſtom, that when a copyhold tenant dies, the widow ſhall have her free-bench in all the deceaſed huſband's lands, whilſt ſhe lives ſingle and chaſte; but if ſhe commits incontinency, ſhe ſhall forfeit her eſtate: nevertheleſs, upon her coming into the court of the manor riding on a black ram, and having his tail in her hand, and at the ſame time repeating a form of words preſcribed, the ſteward is obliged, by the cuſtom of the manor, to re-admit her to her free-beench.

Widow's Bench. See Widow.

BENCHERS, in our inns of court, the ſenior members of the ſociety, who are inveſted with the government thereof.

BEND, in heraldry, one of the nine honourable ordinaries, containing a third part of the field when charged, and a fifth when plain. It is ſometimes, like other ordinaries, indented, ingrailed, &c. and is either dexter or ſiniſter.

Bend *Dexter* is formed by two lines drawn from the upper part of the ſhield on the right, to the lower part of the left, diagonally. It is ſuppoſed to repreſent a ſhoulder-belt, or a ſcarf, when worn over the ſhoulder.

Bend *Siniſter* is that which comes from the left ſide of the ſhield to the right; this the French heralds call a barre.

BENDING, amongſt ſeamen, the faſtening two ends of rope to one another; to faſten a ſail to its yard or ſtay; to fix the cable to the anchor. See Cable, Clench, Sail.

BENDS, in naval architecture, the thickeſt and ſtrongeſt planks in a ſhip, reaching from end to end at her extreme breadth: when a merchant-ſhip is laden no deeper than to bring her bends down to the ſurface of the water, ſhe is ſaid to be in good ſailing order.

BENDY, in heraldry, is the field divided into four or more parts diagonally, and varying in metal and colour.

The general cuſtom of England is to make an even number, but in other countries they regard it not, whether even or odd.

Counter Bendy is uſed by the French to expreſs what we ordinarily call bendy of ſix per bend ſiniſter, counter-changed.

Barry Bendy. } See the articles { Barry.
Paly Bendy. } { Paly.

BENEDICITE, among eccleſiaſtical writers, an appellation given to the Song of the three children in the fiery furnace, on account of its beginning with the word Benedicite.

BENEDICTINS, in church hiſtory, an order of monks who profeſs to follow the rules of St. Benedict.

The Benedictins, being thoſe only that are properly called monks, wear a looſe black gown, with large wide ſleeves, and a capuche, or cowl on their heads, ending in a point behind. In the canon-law, they are ſtyled black-friars, from the colour of their habit.

BENEDICTION, or Blessing. The Hebrews, under this name, underſtand the preſent uſually ſent from one friend to another, as alſo the bleſſing conferred by the patriarchs, on their death-beds, upon their children.

The privilege of benediction was one of thoſe early inſtances of honour and reſpect paid to biſhops in the primitive church. The cuſtom of bowing the head to them, and receiving their bleſſings, was become univerſal. In the weſtern churches there was anciently a kind of benediction which followed the Lord's prayer; and after the communion the people were diſmiſſed with a benediction.

BENEFICE, *Beneficium*, in an eccleſiaſtical ſenſe, a church endowed with a revenue for the performance of divine ſervice; or the revenue itſelf aſſigned to an eccleſiaſtical perſon, by way of ſtipend, for the ſervice he is to do that church.

All ſuch preferments, except biſhoprics, are called benefices; and all benefices are, by the canoniſts, ſometimes ſtyled dignities: but we now ordinarily diſtinguiſh between benefice and dignity, applying dignity to biſhoprics, deaneries, archdeaconries, and prebendaries; and benefice to parſonages, vicarages, and donatives.

Benefices are divided by the canoniſts into ſimple and ſacerdotal; in the firſt there is no obligation but to read prayers, ſing, &c. the ſecond are charged with the cure of ſouls, or the direction and guidance of conſciences; ſuch are vicarages, rectories, &c.

The Romaniſts again diſtinguiſh benefices into regular and ſecular.

Regular or titular benefices are thoſe held by a religious, or a regular, who has made profeſſion of ſome religious order: ſuch are abbies, priories, conventuals, &c. or rather a regular benefice is that which cannot be conferred on any but a religious, either by its foundation, by the inſtitution of ſome ſuperior, or by preſcription: for preſcription, forty years poſſeſſion by a religious, makes the benefice regular.

Secular

Secular benefices are only such as are to be given to secular priests, that is, to such as live in the world, and are not engaged in any monastic order. All benefices are reputed secular, till the contrary is made to appear. They are called secular benefices, because held by seculars; of which kind are almost all cures.

Some benefices, regular in themselves, have been secularized by the pope's bull.

The canonists distinguish three manners of vacatting a benefice, viz. *de jure*, *de facto*, and by the sentence of a judge.

A benefice is vacated *de jure*, when the person enjoying it is guilty of certain crimes expressed in those laws, as heresy, simony, &c.

A benefice is vacated *de facto*, as well as *de jure*, by the natural death, or the resignation of the incumbent; which resignation may be either express, or tacit, as when he engages in a state, &c. inconsistent with it, as, among the Romanists, by marrying, entering into a religious order, or the like.

A benefice becomes vacant by the sentence of a judge, by way of punishment for certain crimes, as concubinage, perjury, &c.

It is observed, that anciently there were five cases by which benefices were acquired; by the nominative, as in royal nomination; by the genitive, as when the children of great men, &c. are provided of benefices by their birth; by the dative, as when speaking of a benefice, it is said *date*, and *dabitur vobis*; by the accusative, as where, by virtue of an accusation, either true or false, an incumbent is dispossessed, and another admitted; by the ablative, as when benefices are taken away by force from the poor and helpless; but the vocative, which is the most just and legitimate, is out of use.

A BENEFICE *in Commendam* is that, the direction and management of which, upon a vacancy, is given or recommended to an ecclesiastic, for a certain time, till he may be conveniently provided for. See the articles REGULAR and SECULAR.

BENJAMIN-TREE, *Benzoine*, in botany, a tree which grows naturally in North America. It rises to the height of eight or ten feet, dividing into many branches, which are furnished with oval spear-shaped leaves, smooth on their upper surface, but with many transverse veins on their under side: these leaves are deciduous, and the flowers are herbaceous. For their generical characters, see the article LAURUS, of which this plant is a species.

The gum Benjamin, or Benzoine, is the juice of this tree, and exsudes from incisions, in form of a thick white balsam: if collected as soon as it has grown somewhat solid, it proves internally white like almonds; and hence is called benzoe canyedaloides: if suffered to lie long exposed to the sun and air, it changes more and more to a brownish, and at last to a quite reddish brown colour.

This resin is moderately hard and brittle; and yields, on being rubbed or warmed, an extremely agreeable sweet smell. It totally dissolves in spirit of wine into a blood-red liquor, leaving only the impurities, which amount commonly to no more than about a scruple, upon an ounce: to water it gives out a portion, not of gummy or mucilaginous, but of saline matter, of a peculiar kind, volatile and sublimable in the fire, and which indeed is most effectually separated by dry sublimation; and hence called flowers of benzoine.

Some prepare the flowers from benzoine by itself, reduced into gross powder; others mix it, in fine powder, with an equal quantity of washed sand. An earthen pot or jar is filled with the matter to one half or one fourth its height, then covered with a conical paper cap, which, as soon as any considerable quantity is judged to be collected, is removed, and supplied by another, and the process continued till nothing more will sublime: the remaining benzoine, which appears of a blackish brown colour, may still be used, if no sand has been mixed, in compositions for yielding an odoriferous smoke, and for other like purposes. This method is not a little troublesome, the quantity of flowers obtained by it small, and the flowers themselves commonly tinged of a yellowish or even a brown colour from some of the oil of the benzoine arising with them; for as the sand grows continually hotter and hotter, it is scarce possible to prevent the heat increasing so far as to elevate a portion of the oil.

Benzoine and its flowers are employed medicinally for resolving and attenuating viscid juices, particularly in disorders of the breast: but the principal use of this fragrant resin is in perfumes, and as a cosmetic, for softening and smoothing the skin. For this last purpose, the benzoine is dissolved in spirit of wine, with the addition sometimes of storax: the solution, mixed with water, forms a white liquor called virgins milk, which on standing slowly deposites a fine white magistery. Some add to the tincture of benzoine, a tincture or solution of litharge in vinegar; and thus obtain a compound virgins milk and magistery, less innocent than those from benzoine alone. A small quantity of the oil of benzoine heightens the smell of perfumes, and corrects rancid unguents and balsams.

BER, in botany, that species of the jugube-tree which produces the gum lacca. See ZIZIPHUS.

BERAMS, a coarse cloth, all made of cotton thread, which comes from the East Indies, and particularly from Surat. There are white plain berams, and others striped with colours. The white are about eleven yards long, and about a yard wide;

the red are fifteen yards long, and something leſs than a yard wide.

BERBERIS, the barberry-buſh, in botany, a ſhrub having fibrous, yellowiſh, creeping roots, from which many ſtalks ariſe to the height of nine or ten feet, whoſe bark is whitiſh without, and yellow within-ſide, and is beſet with ſharp thorns. The leaves are ſmall, oblong, narrow at the bottom, but broader at the top: theſe are of a ſmooth green, ſlightly ſerrated at their edges, and have an acrid taſte. The flowers come out from the wings of the leaves, in ſmall ramoſe bunches; theſe are yellow and hexapetalous, and when decayed are ſucceeded by cylindrical umbilicated berries, of a red colour, containing in each two oblong ſeeds: it flowers in May, and the fruit is ripe in September.

This plant is generally propagated from ſuckers, which it puts out in great plenty from the roots; but thoſe plants are apt to put out a greater number of ſuckers than is required; to prevent which, it is not a bad method to raiſe them by laying: the beſt time for this operation is in autumn, when their leaves begin to fall. The young ſhoots of the ſame year are to be preferred; theſe by the next autumn will be well rooted, when they may be taken off, and planted where they are deſigned to remain.

The fruit of this ſhrub is a mild aſtringent acid, acceptable to the ſtomach, and of great medicinal efficacy in hot bilious diſorders, and a colliquative or putrid diſpoſition of the humours. Proſper Alpinus informs us, that the Egyptians employ, in ardent and peſtilential fevers and in fluxes, a diluted juice of the berries, prepared by macerating them in about twelve times their quantity of water, for a day or a night, with the addition of a little fennel ſeed, or a piece of bread, and then preſſing out and ſtraining the liquor, which is ſweetened with ſugar, or ſugar of roſes, or ſyrup of citrons, and given the patient plentifully to drink. Among us, theſe berries are commonly made into jelly, by boiling them with an equal weight of fine ſugar, over a gentle fire, to a due conſiſtence, and then ſtraining the fluid through a woollen cloth. By drying the berries, their acidity is abated, and their aſtringency improved.

The leaves of the barberry-buſh have likewiſe a hot, ungrateful, reſtringent, acid taſte, and have ſometimes been employed in the ſame intentions as the fruit, and as an ingredient in cooling ſalads. The inner yellow bark, in taſte auſtere and bitteriſh, is ſaid to be gently purgative, and to be ſerviceable in jaundices. Mr. Ray commends, in this diſeaſe, from his own experience, a decoction in ale or other liquors, or rather an infuſion in white wine, of the yellow bark both of the branches and the roots.

BERECYNTHIA, the mother of the gods, in the pagan theology; ſo called from Berecynthus, a mountain in Phrygia. Anchiſes, in Virgil, compares Rome, in her future glories, to this deity.

Gregory of Tours ſays there was, in his time, an idol of Berecynthia or Cybele, worſhipped in Gaul, which they carried into their fields and vineyards in a cart, for the preſervation of the fruits of the earth; and that they marched in proceſſion before the deity, ſinging and dancing. One day this holy man, touched with the impiety of theſe idolaters, put up a prayer to heaven, and made the ſign of the croſs; whereupon the idol immediately fell to the ground, the cart and oxen remaining immoveable: the people whipped the oxen to make them go forwards, but all to no purpoſe. Upon this, four hundred of the multitude cried out, If ſhe be a deity, let her raiſe up herſelf, and make the oxen go on: but this not happening, they all turned Chriſtians. See CYBELE.

BERENGARIANS, a religious ſect of the eleventh century, which adhered to the opinion of Berengarius, who, even in thoſe days, ſtrenuouſly aſſerted, that the bread and wine in the Lord's ſupper is not really and eſſentially, but only figuratively, changed into the body and blood of Chriſt.

His followers were divided in opinion as to the euchariſt: they all agreed that the elements are not eſſentially changed in effect: others admitted a change in part; and others an entire change, with this reſtriction, that to thoſe who communicated unworthily, the elements were changed back again.

BERGAMOT, the name of a fragrant eſſence imported from Italy.

BERGAMOT PEAR. See PEAR-TREE.

BERGHMOT, an aſſembly, or court, held upon a hill in Derbyſhire, for deciding controverſies among the miners.

BERME, in fortification, a ſpace of ground left at the foot of the rampart, on the ſide next the country, deſigned to receive the ruins of the rampart, and prevent their filling up the foſſe. It is ſometimes paliſadoed, for the more ſecurity; and in Holland it is generally planted with a quickſet-hedge. It is alſo called liziere, relais, foreland, retraite, pas de ſouris, &c.

BERNARDIN MONKS, an order of religious founded by Robert Abbot of Molôme: they are properly Ciſtercians, or Monks of Citeaux; but their order having been enlarged and amplified by St. Bernard, they were from thence called Bernardins. They follow the rule of St. Benedict, and are habited in white.

There are likewiſe Bernardin nuns; concerning whoſe inſtitution it is related, in the Life of St. Bernard, that, in the year 1113, which was the fiftieth of the foundation of the abbey of Citeaux, St.

St. Bernard, with thirty companions, devoted themſelves in that convent to a religious life; and as ſeveral of the companions of this ſaint were married, and their wives likewiſe had reſolved to quit the world, and dedicate themſelves to God, a monaſtery was founded for them, at the requeſt of St. Bernard, at Juilli in the dioceſe of Langres. The Bernardin nuns, as well as monks, are ſubject to the laws of the Ciſtercians. See Cisтercians.

BERNICLA. See the article Barnacle.

BERRY, *Bacca*, in botany; ſee Bacca.

BERYL. See Aqua *Marina*.

BES, or Bessis, in Roman antiquity, two thirds of the as. See the article As.

Bes alſo denotes two thirds of the jugerum. See the article Jugerum.

BESANT, or Bezant, a coin of pure gold, of an uncertain value, ſtruck at Byzantium, in the time of the Chriſtian emperors; from hence the gold offered by the king at the altar, is called beſant, or biſant.

Besants, in heraldry, round pieces of gold, without any ſtamp, frequently borne in coats of arms.

BESLERIA, in botany, a genus of didynamious plants, whoſe flower conſiſts of a monophyllous calyx, which contains a ſingle labiated petal, quinquefid and round; the filaments are four in number, two of which are longer than the others; the ſtyle is awl-ſhaped, and reſts on a globoſe germen, which afterward becomes a round berry of one cell, containing many round ſmall ſeeds.

Theſe plants (of which there are three ſpecies) grow naturally in the warm parts of America, from whence the ſeeds have been brought to Europe, and cultivated in ſome curious botanical gardens. They are ſown on a hot bed in the ſpring, and kept in the ſtove in winter.

BETA, beet, in botany, a plant producing apetalous flowers: there are two ſorts cultivated in our culinary gardens; the white beet, called cicla, and the red beet with a turnip root. The white beet has a round, long, white root, with large, broad, ſmooth, thick, ſucculent leaves, ſometimes (as the ſoil and culture may vary them) of a pale, and ſometimes of a deeper green, with a thick broad rib; the ſtalks are ſlender, ſtreaked, and branched; the flowers come out in ſpikes at the wings of the leaves, and each conſiſts of a five-leaved empalement, which contains five ſubulated filaments topped with roundiſh antheræ; the fruit is an unilocular capſule within the baſe of the calyx, and contains a ſingle ſeed. The red beet hath alſo large, thick, ſucculent leaves, which are for the moſt part of a dark red or purple colour: the roots of this ſort are large, and of a deep red colour, on which their goodneſs depends; for the larger theſe roots grow, the more tender they will be, and the deeper their colour, the more they are eſteemed.

There are ſeveral varieties of this ſort, as the common red beet, the turnip-rooted red beet, and the green-leaved red beet. All the different kinds of beet are cultivated in gardens, for the uſe of the kitchen; but they were in greater eſteem formerly than at preſent; however, the red beet is ſtill in uſe to garniſh diſhes. They are propagated by ſowing the ſeeds in March, in a deep looſe ſoil, and when come up ſhould be hoed out, leaving thoſe that are to remain at about ten or twelve inches aſunder: the roots will be fit for uſe in autumn, and continue good all the winter; but in the ſpring they will ſhoot, and become hard and ſtringy. The ſeeds of this plant, by which only it is propagated, ripen about the end of Auguſt, or beginning of September; to obtain them in perfection, ſome of the fineſt roots that have been preſerved from the froſts may be replanted in March, in a well ſheltered place, and let run to ſeed. The roots of beets have, when dry, an agreeable ſweetiſh taſte, which is totally extracted by boiling in rectified ſpirit; the tinctures, on ſtanding ſome weeks in a cool place, depoſite whitiſh ſaline concretions of a ſaccharine ſweetneſs: it is ſaid, a good ſugar may be obtained from the freſh roots, by the method practiſed abroad as with the ſugar cane.

Beets are very little uſed, unleſs in the kitchen, and chiefly the red, which is reckoned cooling and emollient.

BETEL, in botany, an Indian plant, in great uſe and eſteem throughout the Eaſt, where it makes a conſiderable article of commerce.

The betel bears ſome reſemblance to the pepper-tree. Its leaves are like thoſe of ivy, only ſofter, and full of a red juice, which among the orientals is reputed of wonderful virtue for preſerving the teeth, and rendering the breath ſweet. The Indians are continually chewing theſe leaves, which makes their lips ſo red, and teeth black, a colour by them vaſtly preferred to the whiteneſs affected by the Europeans.

The conſumption of betel leaves is incredible, no perſon, rich or poor, being without their box of betel, which they preſent to each other by way of civility, as we do ſnuff.

BETHLEHEMITES, in church-hiſtory, a religious order, called alſo ſtar-bearers, *ſtelliferi*, becauſe they were diſtinguiſhed by a red ſtar with five rays, which they wore on their breaſt, in memory of the ſtar that appeared to the wiſemen, and conducted them to Bethlehem.

There is an order of Bethlehemites ſtill ſubſiſting in the Spaniſh Weſt-Indies, who are habited like Capuchins, with this difference, that they wear a leather girdle inſtead of a cord, and on the

the right ſide of their cloak an eſcutcheon, repreſenting the nativity of our Saviour.

BETONICA, betony, in botany, a genus of didynamious plants. The common or wild ſort has a thick, tranſverſe, fibrous, hairy root, from whence proceed quadrangular knotty ſtalks; ſome of the leaves proceed from the knots, by pairs placed over-againſt each other, and others lay on the ground: theſe are oblong, villous, wrinkled, and of a darkiſh green colour, and crenated on their edges. The flowers grow in ſpikes, and are monopetalous, labiated, and of a purpliſh colour; the upper-lip is ſulcated and reclining backward, but the lower conſiſts of three lobes; each flower contains four ſubulated ſtamina, and the calyx is cut into five ſegments, from whence proceeds a piſtil, fixed to the hinder part of the flower, like a nail, with four embryoes, which change to as many ſeeds.

Betony is common in woods and ſhady places in England, and flowers in June or July; it is reckoned diſcutient and aperient, and has been always accounted an excellent medicine for the head; the leaves reduced to powder promote ſneezing, for which reaſon, and for its being a cephalic, it is always an ingredient in the herb-ſnuff. Antonius Muſa wrote a treatiſe about it, and commends it much as a vulnerary, eſpecially in wounds of the head; and ſome recommend its juice boiled up to the conſiſtence of honey, and mixed up with a ſmall quantity of the Peruvian balſam, as a great healer. Beſides the common betony, botaniſts enumerate ſix other ſpecies, which are natives of foreign countries.

BETULA, the birch-tree; ſee the article BIRCH.

BEVEL, among maſons, carpenters, joiners, and bricklayers, a kind of ſquare, one leg whereof is frequently crooked, according to the ſweep of an arch or vault. It is moveable on a center, and ſo may be ſet to any angle.

BEVEL-ANGLE, any other angle beſides thoſe of ninety or forty-five degrees.

BEVILE, in heraldry, a thing broken or opening like a carpenter's rule: thus we ſay, he beareth argent, a chief bevile, vert, by the name of Beverlis.

BEURERIA, the Carolina all-ſpice, in botany, a plant whoſe root is large and ſpreading, from which ariſeth the ſtem, divided into many ſlender branches, which ſpread irregularly, and the bark is of a pale brown; theſe are furniſhed with broad leaves of a lanceolate oval form, and of a lively green; they ſtand in pairs, and are placed oppoſite at every joint: the flowers come out from the wings of the leaves, and are large, elegant, and of a deep but very duſky purple, compoſed of two ſeries of narrow thick petals, irregularly diſpoſed and waved; the embyro ſits beneath the flower, and ſupports five ſtigma: this afterward appears to have five cells, containing the ſame number of ſeeds.

The bark of this ſhrub is brown, and has a very ſtrong aromatic ſcent, from which circumſtance the inhabitants of Carolina gave it the name of all-ſpice. This plant is propagated by layers, and in a warm ſituation will bear the cold in this climate tolerably well.

BEWITS, in falconry, pieces of leather to which a hawk's bells are faſtened, and buttoned to his legs.

BEY, among the Turks, ſignifies a governor of a country or town. The Turks write it *begh*, or *bek*, but pronounce it bey.

BEY *of Tunis*, the ſame with the dey of Algiers, is the prince or king of that kingdom.

BEZANS, cotton cloths, which come from Bengal; ſome are white, and others ſtriped with ſeveral colours.

BEZANT, or BESANT. See the article BESANT.

BEZANTHER, the branch of a deer's horn, next below the brow-antler.

BEZOAR, in natural hiſtory and medicine, a general name for certain animal ſubſtances, formerly ſuppoſed to be effectual in preventing the fatal conſequences of poiſon; but at preſent are very little valued, their boaſted virtues being found to be merely chimerical.

BEZOARDIC, an appellation given to whatever partakes of the nature of bezoar; alſo to compound medicines whereof bezoar makes an ingredient.

BIA, in commerce, a name given by the Siameſe to thoſe ſmall ſhells which are called cowries throughout almoſt all the other parts of the Eaſt-Indies. See the article COWRIES.

BIBLE, βιβλος, the book, a name given by Chriſtians, by way of eminence, to a collection of the ſacred writings, containing thoſe of the Old and New Teſtament, and is juſtly looked upon as the foundation of the Jewiſh as well as the Chriſtian religion. The Jews, it is true, acknowledge only the Scriptures of the Old Teſtament, the correcting and publiſhing of which is unanimouſly aſcribed both by the Jews and Chriſtians to Ezra. Some of the ancient fathers, on no other foundation than that fabulous and apocryphal book the ſecond of Eſdras, pretend that the Scriptures were entirely loſt in the Babyloniſh captivity, and that Ezra had reſtored them again by divine revelations. What is certain is, that in the reign of Joſiah, there were no other books of the law extant, beſides that found in the temple by Hilkiah; from which original that pious king ordered copies to be immediately written out, and ſearch made for all the parts of the Scriptures, by which means copies of

of the whole became pretty numerous among the people, who carried them with them into captivity. After the return of the Jews from the Babyloniſh captivity, Ezra got together as many copies as he could of the ſacred writings, and out of them all prepared a correct edition, diſpoſing the ſeveral books in their natural order, and ſettling the canon of the Scripture for his time, having publiſhed them, according to the opinion of moſt learned men, in the Chaldee character, as the Jews, upon their return from the captivity, brought with them the Chaldaic language, which from that time became their mother-tongue, and probably gave birth to the Chaldee tranſlation of their Scriptures.

Chaldee BIBLE is only the gloſſes, or expoſitions made by the Jews when they ſpoke the Chaldee tongue; whence it is called *Targumim*, or paraphraſes, as not being a ſtrict verſion of the Scriptures.

Hebrew BIBLE. There is in the church of St. Dominic, in Bononia, a copy of the Hebrew Scriptures, which they pretend to be the original copy, written by Ezra himſelf. It is written in a fair character, upon a ſort of leather, and made up into a roll, after the ancient manner: but its having the vowel points annexed, and the writing being freſh and fair, without any decay, theſe circumſtances prove the novelty of the copy.

Greek BIBLE. It is a diſpute among authors, whether there was a Greek verſion of the Old Teſtament more ancient than that of the ſeventy-two Jews employed by Ptolemy Philadelphus to tranſlate that book: before Our Saviour's time, there was no other verſion of the Old Teſtament beſides that which went under the name of the Septuagint. See SEPTUAGINT. But after the eſtabliſhment of Chriſtianity, ſome authors undertook new tranſlations of the Bible, under pretence of making them more conformable to the Hebrew text. There have been about ſix of theſe verſions, ſome whereof are charged with having corrupted ſeveral paſſages of the prophets relating to Jeſus Chriſt; others have been thought too free in their verſions, and others have been found fault with for having confined themſelves too ſervilely to the letter.

Latin BIBLE. It is beyond diſpute that the Latin churches had, even in the firſt ages, a tranſlation of the Bible in their language, which being the vulgar language, and conſequently underſtood by every body, occaſioned a vaſt number of Latin verſions. Among theſe there was one which was generally received, and called by St. Jerom the Vulgar or common tranſlation. St. Auſtin gives this verſion the name of the Italic, and prefers it to all the reſt. There were ſeveral other tranſlations of the Bible into Latin, the moſt remarkable of which are the verſions of St. Jerom, Santes Pagninus, cardinal Cajetan, and Iſiodore Clarius, all from the Hebrew text.

Beſides theſe tranſlations by Catholic authors, there are ſome made by proteſtant tranſlators of the Hebrew; the moſt eminent of their verſions are thoſe of Sebaſtian Munſter, Leo Juda, Sebaſtian Caſtalio, Theodore Beza, &c.

Syrian BIBLE, a very ancient tranſlation of the Scriptures into the Syriac language. Dr. Prideaux is of opinion that it was made in the firſt century after Chriſt; that the author of it was ſome Chriſtian of the Jewiſh nation; and that it is the beſt tranſlation of the Old Teſtament. This verſion is not always agreeable to the Hebrew text, but in ſome places more conformable to the Samaritan Pentateuch, and in others to the verſion of the Septuagint.

Arabic BIBLE. There are two ſorts of Arabic verſions of the Bible; the one performed by Chriſtians, the other by Jews. Among the former there is one printed in the Polyglots of Paris and England, but both the author and the time it was written are unknown. Among all the Jewiſh performances of this kind, one only has been printed entire, which was done by Erpenius, at Leyden, in the year 1622.

Ethiopic BIBLE. This verſion of the Old Teſtament was made immediately from the Greek text of the Septuagint; and there is a very plain agreement between this tranſlation and the Alexandrine manuſcript; the order of the chapters, the inſcriptions of the Pſalms, and every thing elſe being exactly ſimilar. The Ethiopians attribute this verſion to Frumentius, the apoſtle of Ethiopia, ſent thither by Athanaſius, biſhop of Alexandria.

Coptic, or *Egyptian* BIBLE, a tranſlation of the Scriptures made immediately from the Greek of the Septuagint; and in which the Egyptian tranſlator ſo religiouſly followed the Greek text, that he refuſed to make uſe of the labours of Origen and others, who had taken the pains to compare the Greek verſion with the Hebrew text. This verſion is doubtleſs very ancient, though neither the author, nor exact time of its being performed, are known.

Perſian BIBLE. There are ſeveral verſions of the Bible in the Perſian language, moſt of which are in manuſcript. Walton, in the London Polyglot, has publiſhed the goſpels, tranſlated by one Simon, the ſon of Joſeph, a Chriſtian of Perſia, who lived about the middle of the fourteenth century.

Turkiſh BIBLE. There are ſeveral manuſcript tranſlations of the Bible in the Turkiſh language; and a verſion of the New Teſtament was printed at London in the year 1666.

Armenian BIBLE, a very ancient tranſlation of the Scriptures into the Armenian language from the

crowned with two or more erect sharp awns. Botanists enumerate seven species of this plant, which are all natives of different parts of America.

BIDON, a liquid measure, containing about five pints of Paris, that is, about five quarts English, wine measure. It is seldom used but among ships crews.

BIGAMY, the possession of two wives at the same time. This is the interpretation of the word, in a law passed 1 Jac. I. which makes bigamy felony. Among the Romans, persons convicted of bigamy were branded with a note of infamy; and in France, they were anciently punished with death.

BIGAMY, in the canon law, is when a person either marries two women successively, or only marries one woman who had been married before; both which cases are accounted impediments to be a clerk, or to hold a bishopric. It is also bigamy when a person marries a woman who had been debauched before; or when he hath known his own wife after she has been debauched by another.

The Romanists make a kind of bigamy by interpretation; as when a person in holy orders, or that has made profession of some monastic order, marries. This the bishop can dispense with on some occasions.

Spiritual BIGAMY is when a person holds two incompatible benefices, as two bishoprics, two vicarages, &c.

BIGHT, in the marine, the double part of any rope, in contradistinction to the end; as, the bight of his cable has swept our anchor, that is, a part of the cable of another ship, in winding, has entangled itself under the claw or flook of our anchor. See ANCHOR.

BIGNONIA, the trumpet-flower, in botany, a plant having a rough stem, which sends out many weak trailing branches, which are furnished with winged leaves at every joint, placed opposite, and are composed of four pair of folioles, or small leaves, terminated by an odd one; these are serrated on their edges, and end in a long sharp point: the flowers, which are monopetalous and campanulated, are produced at the ends of the shoots of the same year in large bunches; these have swelling tubes shaped somewhat like a trumpet, from whence they had the appellation of trumpet-flower: they are of an orange colour, and appear the beginning of August; the fruit is a pod with two cells and two valves, containing several imbricated, compressed, winged seeds. This plant is propagated from seeds or cuttings.

BIGOT, a person foolishly obstinate, and perversely wedded to any opinion, but particularly an opinion of a religious nature.

BILANDER, in the marine, a small merchant vessel of two masts, having her main-yard and sail stretching from the middle of the deck to the stern, parallel to her length, instead of hanging across, like those of other larger ships: the after, or hinder end of a bilander's main-yard is likewise peeked up, so as to form nearly an angle of forty-five degrees with the mast on which it is suspended.

Few vessels, however, are now equipped in this method, probably from the observation of its being attended with several inconveniencies.

BILE, BILIS, a yellow bitter liquor, separated from the blood in the liver, collected in the porus biliarius and gall-bladder, and thence discharged by the common duct into the duodenum.

The bile, when out of the body, is highly bitter, and the most acrid of all the animal fluids; it is neither of an alcaline nor an acid quality. It resists acescence, and conveys the same quality to other substances with which it is mixed. It tends very much to putrefaction, which it promotes, when added to other substances disposed to it. It very soon mixes with water; and, when inspissated over a gentle fire, it dissolves, if exposed to the air. It does not burn in the fire, unless it be previously dried. It renders oil and oleaginous substances miscible with water. If it be rubbed with any tenacious substances, such as resins or gums, it resolves and attenuates them. It is coagulated by fire, alcohol of wine, acid spirits, and extract of galls. See *Boerhaave Chym.* Vol. I. and his *Institut. Med.* Sect. 99.

From the preceding, and a great number of other experiments made on this fluid by Baglivi, Du Hamel, &c. it plainly appears, that the bile is a humour composed of an oil, a salt, and water. It may therefore be considered as a liquid animal sope, so that it is of an abstergent and resolvent quality. That it is so, the practice of some tradesmen is a sufficient proof; for dyers of cloth, in order to take out the grease which sticks to the wool, and hinders the adhesion of the colour, use sope, or putrid urine, after it has assumed an alkaline nature, or a lixivium of some fixed alkali: but they may, with equal success, use ox gall for the same intention. Painters also use the bile of animals for mixing and diluting their colours. It discovers its efficacy to be the same in medicines, where a saponaceous quality is required, or where the intention is to abstergе, where the sluggish vessels are to be stimulated, where a tenacious substance is to be resolved, or a viscid one attenuated. See *Boerh. Aph.* LXXV. 5.

BILGES, in naval architecture, those parts of the bottom of a ship, on either side, that approach nearer to an horizontal than a perpendicular direction, and on which the ship would rest if laid on the ground, or more particularly those parts on which she would rest only, exclusive of the keel which divides them.

BILGES are terminated in the ship's fore part by the lower part of the bow, and the hinder part by the

the buttock. See the articles Bow, Keel, and Buttock.

BILINGUIS, in a general use, implies a person who speaks two languages; but in law is used to signify a jury in a trial between an Englishman and a foreigner, when one half are natives, and the other strangers.

BILIOUS, something relating to the bile, or that partakes of its nature.

Bilious *Fever*. See Fever.

BILL, in mechanics, a cutting instrument of iron, in the form of a crescent, used by husbandmen, gardeners, &c.

Bill, in trade, signifies an account of goods delivered to, or of work done for, a person.

Bill *of Credit*, an order given by a merchant or banker to a person, impowering him to receive money from his correspondents in foreign countries.

Bill *of Entry*, an account of goods entered at the custom-house, both inwards and outwards.

Bill *of Exchange*, a short order written on a slip of paper, by a merchant, &c. for paying to such a person, or his order, and in some countries to the bearer, in a distant place, a certain sum of money.

There are three things necessary to constitute a bill of exchange. 1. That it be drawn in one place upon some person in another. 2. That there be three persons concerned, the drawer, the presenter, or person in whose favour it is drawn, and the acceptor, or him on whom it is drawn. It must also mention that the value which the drawer has received, is either in bills of exchange, in money, merchandize, or other effects, which are to be expressed.

These bills are made payable either at sight, or so many days, weeks, or months after date; the space of a month being called usance, and two or three months after date, double or treble usance.

Bills of exchange are also either inland or foreign; the former is said to be only in the nature of a letter; but the latter is more regarded in law, because it is for the advantage of commerce with other countries, and consequently renders it an object of public concern.

Not only the drawer, but also every indorser of a bill is liable to the payment of it; for an indorser charges himself in the same manner, as if he had originally drawn the bill: and the plaintiff, in an action in such a case, is not obliged to prove the drawer's hand, because the indorser becomes a new drawer. He must however prove that he demanded the money of the drawer or drawers, or that he made enquiry, and could not find them in convenient time; for by the custom established among merchants, the indorser is to receive the money of the first drawer if he can; but if he cannot, the indorser must answer it.

The forging a bill of exchange, or any acceptance, is felony.

Bill *of Lading*, an acknowledgement signed by the master of the ship, and given to a merchant, &c. containing an account of the goods which the master has received on board from that merchant, &c. with a promise to deliver them at the intended place for a certain sum of money. Each bill of lading must be treble, one for the merchant who ships the goods, another to be sent to the person to whom they are consigned, and the third to remain in the hands of the master of the ship. It must however be observed, that a bill of lading is only used when the goods sent on board a ship are but part of the cargo; for when a merchant loads a vessel entirely on his own account, the deed passed between him and the master of the ship is called charter-party. See Charter-Party.

Bill *of Parcels*, an account given by the seller to the buyer, containing the particulars of all the sorts and pieces of the goods bought.

Bill *of Sale* is when a man, wanting a sum of money, delivers goods as a security to the lender, to whom he gives this bill, impowering him to sell the goods, in case the sum borrowed is not repaid with interest at the time appointed.

Bill *of Store*, a licence granted at the custom-house to merchants, by which they have liberty to carry duty-free, all such stores and provisions as the ship's crew may have occasion for during the voyage.

Bill *of Sufferance*, a licence granted to a merchant at the custom-house, suffering him to trade from one English port to another, without paying custom.

Bank Bill. See Bank.

Bill, in law, a security for money under the hand, and sometimes the seal of the debtor. It is of two sorts, a single bill without or with a penalty; the latter is the same as a bond, except its being without a condition.

Bill also implies a declaration in writing, expressing either some wrong the complainant has suffered from the defendant, or a fault committed by the person complained of against some law or statute.

This bill is sometimes exhibited to justices at the general assizes, by way of indictment, or referred to others having jurisdiction; but is more generally addressed to the lord chancellor. It contains the fact complained of, the damage sustained, and a petition or process against the defendant for redress; and is used both in criminal and civil cases. In the former, the words *billa vera* are indorsed by the grand jury upon a presentment, implying that they find the same founded on probable evidence, and therefore worthy of further consideration.

Bill *in Parliament*, signifies a paper containing propositions offered to the house to be passed by

them, and afterwards to be presented to the king, in order to receive the royal assent, and become a law.

Bill *of Attainder*, Bill *of Appeal*, Bill *of Mortality*, } See { Attainder. Appeal. Mortality.

BILLET, in heraldry, a bearing in form of a long square. They are supposed to represent pieces of cloth of gold or silver; but Guillim thinks they represent a letter sealed up; and other authors take them for bricks.

Billeté implies that the escutcheon is all over strewed with billets, the number not ascertained.

Billet-Wood, small wood for fewel, cut three foot and four inches long, and seven inches and a half in compass; the assize of which is to be enquired of by justices.

BILLETING, in military affairs, is the quartering of soldiers in the houses of a town or village. Among fox-hunters, it signifies the ordure and dung of a fox.

BILLON, in the history of coins, a composition of precious and base metals, where the latter predominate: wherefore gold, under twelve carats fine, is called billon of gold; and silver, under six penny-weight, billon of silver. So little attention was paid formerly to the purity of gold and silver, that the term billon of gold was applied only to that which was under twenty-one carats; and billon of silver to that which was lower than ten penny-weight.

BIMEDIAL. If two medial lines AB and BC (Plate XVIII. *fig.* 11.) commensurable in power only, are compounded, and contain a rational rectangle, the whole line AC is irrational, and called a first bimedial line. *Barrow's Euclid. Lib.* X. *Prop.* 38.

BINARY Arithmetic, that wherein unity or 1 and 0 are only used.

This was the invention of Mr. Leibnitz, who shews it to be very expeditious in discovering the properties of numbers, and in constructing tables: and Mr. Dangecourt, in the History of the Royal Academy of Sciences, gives a specimen of it concerning arithmetical progressionals; where he shews that, because in binary arithmetic only two characters are used, therefore the laws of progression may be more easily discovered by it than by common arithmetic.

The author, however, does not recommend this method for common use, because of the great number of figures required to express a number.

Binary Measure, in music, is a measure which is beaten equally, or where the time of rising is equal to that of falling; usually called common time.

BIND-WEED, *Convolvulus*, in botany; see Convolvulus.

BING, in the alum works, denotes a heap of alum thrown together in order to drain.

BINNACLE, in the marine, a wooden case or box standing upon the quarter-deck, immediately before the helm, or steering-wheel, containing three little apartments, viz. one in the middle for a light, and those on each side for the sea-compasses which direct the ship's course: the middle division has a glass on each side, whereby to throw a light upon the compass, that the man at the helm may observe it in the darkest weather. There are always two binnacles on the deck of a ship of war; one being designed for the man who steers, and the other for the officer who superintends the steerage, which is called conning. See Compass, and Quarter-Master.

BINOCULAR *Telescope*. See Telescope.

BINOMIAL *Root*, in algebra, is a root consisting of two members connected with the sign +, or −: thus $1+x$, or $1-x$ are binomials consisting of the sums and differences of these quantities. See *Binomial* Root.

BIOGRAPHY, a very instructive species of history, containing the lives of remarkable persons.

The word is formed from the Greek βιος, life, and γραφω, to describe.

BIOUAC, in military affairs, a night-guard performed by the whole army, when there is any apprehension of danger from the enemy.

BIQUADRATIC, the fourth power of any number or quantity.

Biquadratic *Equation*, in algebra, is an equation where the unknown quantity has four dimensions; thus, $x^4+px^3+paax^2+pa^2x+a^4=0$, is a biquadratic equation, because the unknown term x, is of four dimensions. See *Biquadratic* Equation.

BIQUINTILE, an aspect of the planets when they are 144 degrees distant from each other.

BIRCH-TREE, *Betula*, in botany, a genus of amentaceous plants. The common birch grows in several woods in England; it is tall, and produces many flexible branches. The outer bark of the trunk is thick, rough, whitish, and full of clefts; that which lies next is smooth and transparent: the wood is white, and the boughs are so tough and flexible, that they are much used for making hoops for casks, and their twigs are commonly employed for making brooms. The leaves are somewhat oval, serrated, and of a deep green. The flowers are male and female, and produced on katkins, which are about an inch and a half long, consisting of many reddish florets, disposed like scales; in the female flower the calyx is lightly divided into three segments. The fruit is a cylindric cone,

cone, having ſeeds which are oval, winged, and included in the ſcales of the katkin.

This tree is propagated by ſuckers or young plants, from the woods where they naturally grow; but in places where there are no young plants near, they may be raiſed from ſeeds, which ſhould be carefully gathered when the ſcales begin to open, which is in autumn, and is the proper ſeaſon for ſowing, obſerving to chuſe a ſhady ſituation, where the plants will thrive much better than if expoſed to the full ſun. Birch being much eſteemed for its wood, may be cultivated upon barren lands, where better trees will not thrive; for there is no ground ſo bad but this tree will thrive in it; it will grow in moiſt ſpringy land, or in dry gravel or ſand, where there is little ſurface. Theſe may be tranſplanted any time from the middle of October till the middle of March, when the ground is not frozen. In dry land the autumn is the beſt ſeaſon, but where it is moiſt, the ſpring is to be preferred: the diſtance they ſhould be planted is ſix feet ſquare, that they may ſoon cover the ground, and by ſtanding cloſe they will draw each other up, and thrive the better where they are much expoſed. When young trees have been planted two years, they ſhould (if deſigned for underwood) be cut down within ſix inches of the ſurface, which will cauſe them to ſhoot out ſtrong and vigorous branches; but if they are deſigned for large trees, it will be better to let them ſtand three years before they are headed down, which ſhould be done within three inches of the ground, that their ſtems may be ſtraight and handſome, obſerving when they put out, whether they produce more than one ſhoot, which if they do, they muſt all be cut off, except the ſtrongeſt and moſt convenient ſhoot, which muſt be trained up for a ſtem.

The timber of birch, though accounted the worſt of all others, yet is not without its various uſes: beſides its ſervice for hoops and brooms, it is uſed for ox-yokes, in chair-making, diſhes, bowls, ladles, and for divers other purpoſes. In Ruſſia and Poland they cover their houſes with the bark of the birch-tree, inſtead of ſlate or tile.

In ſome places theſe trees are tapped in the ſpring, and the ſap drawn out to make birch-wine, which is done in the following manner: In the middle of March, cut an oblique hole, or rather a ſlit, under the branch of a well ſpreading birch-tree, which keep open by a ſmall wedge of wood, or ſtone put therein: to this hole or ſlit fix a bottle, to receive that clear water or ſap as will diſtil itſelf out of the aperture into the bottle, which muſt be taken away when full, and others fixed in its place. It is ſaid, that one tree will bleed a gallon or two in a day. Having in this manner obtained a ſufficient quantity of the ſap or birch-water, put to every gallon thereof a quart of honey, well ſtirred up together, and boil it almoſt an hour with a few cloves, and a little lemon-peel, keeping it well ſcummed. When it is ſufficiently boiled, and after become cold, put to it two or three ſpoonfuls of good ale-yeaſt, which will cauſe it to work like beer: when the yeaſt begins to ſettle, bottle it up, as is done by other liquors, and in a competent time it will become a moſt briſk and ſpirituous wine, and a very great opener. If honey ſhould be diſagreeable, inſtead thereof uſe a pound of the beſt double-refined ſugar; or it may be dulcified with the beſt Malaga raiſins, which laſt will make it an exceeding fine wine. This wine is very good for the phthiſic, diſſolves the ſtone in the bladder, and greatly ſharpens the appetite, being drank before eating.

The leaves and bark of the birch-tree have been employed chiefly externally, as reſolvents, detergents, and antiſeptics. With regard to the leaves, they diſcover to the touch a reſinous unctuoſity, and to the taſte an unpleaſant bitterneſs: being rubbed a little, they yield a pretty ſtrong, and not diſagreeable ſmell. The bark has been recommended in fumigations for correcting contagious air; the membranes are highly inflammable, in burning yield no particular ſmell, and give out a reſinous exſudation without ſmell or taſte; the brittle part is leſs inflammabe; it emits a ſtrong acid vapour without reſin.

There are three other ſpecies of birch, one of which is a native of the Alps, and the northern parts of France; and the others of North America, where the Indians make canoes of their bark, which are very light, and of long duration.

BIRD, *Avis*, in zoology, one of the ſix general claſſes of animals, the characters of which are, that their body is covered with feathers, and that they have two wings, two legs, and a bill of a horny ſubſtance; the females likewiſe are all oviparous.

The knowledge of birds, of the orders and genera into which they are ſubdivided, and of their natures, uſes, figures, &c. conſtitutes a particular ſcience, under the name of ornithology. See ORNITHOLOGY.

BIRD-LIME, a viſcid ſubſtance, prepared after different ways. The moſt common bird-lime among us is made from holly-bark, boiled ten or twelve hours; when the green coat being ſeparated from the bark, it is covered up a fortnight in a moiſt place, then pounded into a tough paſte, ſo that no fibres of the wood are diſcernible, and waſhed in a running ſtream till no motes appear, put up to ferment four or five days, ſkimmed as often as any thing ariſes, and laid up for uſe. To uſe it, a third part of nut-oil, or thin greaſe, muſt be incorporated with it over the fire.

BIRD's-FOOT, in botany; ſee ORNITHOPUS.

BIRTH,

BIRTH, *Partus*, in midwifery, ſignifies the ſame with delivery. See the article DELIVERY.

An immature birth, or that which happens before the uſual time of pregnancy is completed, is otherwiſe called an abortion. See the article ABORTION.

For the proportion of births to marriages, burials, &c. ſee the articles MARRIAGES, BURIAL, &c.

After-BIRTH. See AFTER-*Birth*.

BIRTH, in the marine, the ſtation in which a ſhip rides at anchor, either alone, or in a fleet or ſquadron; or the diſtance between a ſhip and any adjacent object; as ſhe lies in a good birth, *i. e.* is moored in a convenient ſituation, or at a proper diſtance from the ſhore, and other veſſels.

Birth alſo ſignifies the room or apartment where any particular number of the officers or crew eat and ſleep: in a ſhip of war, there is commonly one of theſe between every two guns.

BIRTHWORT, in botany; ſee ARISTOLOCHIA.

BIS, in botany, a name given by the ancients to two different genuſes of plants, now called monkſhood and hemlock.

BIS ANNUAL, an appellation given to ſuch plants as do not flower till the ſecond year.

BISCUTELLA, buckler-muſtard, in botany, a genus of plants producing cruciform flowers, each conſiſting of four obtuſe petals: in the center is placed an orbicular compreſſed germen, ſupporting a ſingle premanent ſtyle; it hath ſix ſtamina, two of which are ſhorter than the reſt; the fruit is a compreſſed bilocular erect capſule, containing a ſingle compreſſed ſeed. This genus was called by Tournefort thlaſpidium, and are natives of ſeveral parts in the ſouth of Europe.

BISERRULA, in botany, an annual plant, which grows naturally in Italy, Sicily, Spain, and the ſouth of France; it ſends forth many angular ſtalks, which trail on the ground, and are ſubdivided into many branches, which are furniſhed with long winged leaves, compoſed of many pairs of lobes, and terminated by an odd one: theſe are heart-ſhaped. Toward the upper part of the branches comes out the pedicle, which ſuſtains ſeveral papilionaceous flowers, of a purple colour, collected together; which are ſucceeded by plain pods about an inch long, indented on both ſides, and divided in the middle by a longitudinal nerve, containing two rows of kidney-ſhaped ſeeds.

This plant was called by Tournefort pelecinus.

BISHOP, a prelate, or perſon conſecrated for the ſpiritual government of a dioceſe.

A biſhop is the higheſt eccleſiaſtical dignitary, the chief officer in the hierarchy or œconomy of church government. The apoſtles, after our Saviour's aſcenſion, went forth preaching the goſpel in the particular provinces allotted to them, and appointed the firſt converts of every place through which they paſſed, or, as Clemens Romanus expreſſes it, "the firſt fruits of their "miniſtry," to be the biſhops and deacons of the churches planted by them. Thus Tertullian ſays, Clemens was ordained biſhop of Rome by St. Peter, and Polycarp biſhop of Smyrna, by St. John.

The earlieſt account we have of Britiſh biſhops is carried up no higher than the council of Arles, aſſembled by the emperor Conſtantine, in the fourth century; at which were preſent the biſhops of London, York, and Caerleon.

Upon the vacancy of a biſhop's ſee, the king grants a licence, or *congé d'eſlire*, under the great ſeal, to the dean and chapter, to elect the perſon whom by his letters miſſive he hath appointed; and they are to chooſe no other. The dean and chapter having made their election accordingly, certify it under their common ſeal to the king, and to the archbiſhop of the province, and to the biſhop thus elected: then the king gives his royal aſſent, under the great ſeal, directed to the archbiſhop, commanding him to confirm and conſecrate the biſhop thus elected. The archbiſhop then ſubſcribes his *fiat confirmatio*, and grants a commiſſion to the vicar-general to perform all the acts requiſite thereto: who thereupon iſſues out a ſummons to all perſons who may object to the election, to appear, &c, which citation is affixed on the door of Bow-church. At the time and place appointed, the proctor for the dean and chapter exhibits the royal aſſent, and the commiſſion of the archbiſhop, which are both read, and accepted by the vicar-general. Then the new biſhop is preſented by the proctor of the vicar-general; and three proclamations being made for the oppoſers of the election to appear, and none appearing, the vicar-general confirms and ratifies the choice of the perſon elected; who takes the oaths of ſupremacy, canonical obedience, and that againſt ſimony.

Till this act of confirmation is performed, the biſhop elect may be rejected, becauſe there may be reaſons aſſigned why he ſhould not be made a biſhop; which is the reaſon of the above-mentioned citations and proclamations.

A biſhop of England is a peer of the realm, and, as ſuch, ſits and votes in the houſe of lords. He is a baron in a threefold manner, viz. feudal, in regard of the temporalities annexed to his biſhopric; by writ, as being ſummoned by writ to parliament; and by patent and creation. Accordingly he has the precedence of all other barons, and votes both as baron and biſhop.

BISHOP'S-COURT, an eccleſiaſtical court, held in the cathedral of each dioceſe by the biſhop's chancellor, who judges by the civil and canon law; and

and if the diocese be large, he has commissaries in remote parts, who hold what they call consistory courts, for matters limited to them by their commission.

Bishop's-reed, in botany. See Ammi.

BISHOPING, a term among horse-dealers, to denote the several artifices used by them on an old or bad horse, to conceal his natural defects, and impose upon the buyer.

BISHOPRIC, a diocese, or the district over which a bishop's jurisdiction extends.

BISKET, or Biscuit, a general name for the bread used in the sea-service, especially in long voyages.

Bisket, in order to be good, should be made six months before it is put on board a ship; it should also be made of good wheat flour, thoroughly cleaned from the bran.

Manner of making Sea-Biscuit. The flour is first wet in the kneading-trough, with a sufficient quantity of water, and covered for some time with a cloth. It is then well kneaded with a brake, and the dough divided into pieces of about three ounces each. These pieces are again kneaded singly, and laid in rows, and the baker, after shaking some flour over them, lays another row upon the former; and continues kneading and placing his pieces of dough upon the last pieces, till the whole batch, or quantity baked at once, is finished: the pieces of dough are then flatted into cakes, pricked with an instrument for that purpose, and placed regularly in the oven, where they stand about half an hour, when they are taken out of the oven, and carried to the store-room.

The oven is sufficiently heated while the dough is kneading and forming into cakes, so that there is no loss of time during the whole day. Five persons are sufficient for two ovens, two of which are the master-bakers, which have each a mate, the fifth person being called the idle-man. The master-bakers assist in kneading the dough, and flattening it into cakes, and setting the biskets in the ovens. The mates also assist in kneading the dough, flattening it into cakes, heating the oven, and tossing the cakes into it. The last operation they perform with great dexterity, the master-baker constantly catching the cake on his peel, and placing it regularly in the oven. The idle-man fetches in the wood, wets and kneads the flour in the kneading-trough, takes it thence, and kneads it with the brake, carries it into the bake-house, pricks the cakes, and carries them to a small table placed at the oven's mouth, whence the mate takes them, and tosses them into the oven.

Bisket, among confectioners, signifies a kind of bread made of fine flour, eggs and sugar, with the addition of rose or orange-flower-water. Sometimes aniseeds, carraway-seeds, preserved orange, citron, or lemon-peel, are added, and the different compositions distinguished by different names, as seed-bisket, long-bisket, round-bisket, Naples-bisket, spunge-bisket, &c.

BISMUTH, or Tin-Glass, in natural history, a sparkling white semi-metal, very ponderous, considerably hard and sonorous, extremely brittle, without any degree of malleability, falling in pieces under the hammer, and reducible by triture into fine powder. When broke, the surface of the fracture appears composed of bright plates or flakes, larger than those of the other semi-metals. In its external appearance, it has a great resemblance to regulus of antimony and zinc, differing little otherwise than in the largeness of the plates, and in its contracting a yellowish cast on the surface exposed to the air. In its intrinsic properties, it is extremely different; melting far more easily, not evaporating so readily, being differently acted upon by acids, producing different effects upon other metallic bodies, &c.

BISNOW, or Bischnou, a sect of the Banians in the East-Indies, who live wholly on herbs, pulse, butter, and milk. They sing hymns in honour of their god, whom they call Ram-ram, and mix their devotions with dances and the sounds of musical instruments.

BISSECTION, in geometry, the dividing a line, angle, &c. into two equal parts.

BISSEXTILE, in chronology, a year consisting of 366 days, being the same with our leap-year; likewise the day which is this year added, is called bissextile. The mean tropical year, or that mean space of time wherein the sun or earth, after departing from any point of the ecliptic, returns to the same again, consists, according to Dr. Halley's tables, of 365 days, 5 hours, 48 minutes, 55 seconds: but the year made use of by the antient Egyptians consisted only of 365 days, which being 5 hours, 48 minutes, 55 seconds too little, they lost a day nearly every four years. Julius Cæsar, when high-priest among the Romans, observing the inconveniency, ordered that every fourth year should have an additional or intercalary day, and the year when it happened was called bissextile; but this method of computation (which is called the Julian, or Old Stile,) is erroneous; for the equinoxes and solstices anticipate or come earlier than the Julian account supposes them to do by 11′ 5″ in each mean Julian year, or 44 minutes, 20 seconds in every four years, or 3 days, 1 hour, 53 minutes, and 20 seconds, in every four hundred Julian years.

In order to correct this error in the Julian year, the authors of the Gregorian method of regulating the year, when they reformed the calendar in the beginning of October 1582, directed that three intercalary days should be omitted or dropped every four hundred years, by reckoning all those years whose dates consist of a number of intire hundreds

not divisible by 4, such as 1700, 1800, 1900, 2100, &c. to be only common and not bissextile, or leap years, as they would otherwise have been, and consequently omitting the intercalary days, which, according to the Julian account, should have been inserted in the month of February in those years; but, at the same time, they ordered, that every fourth hundredth year consisting of a number of intire hundreds divisible by 4, such as 1600, 2000, 2400, 2800, &c. should still be considered as bissextile or leap years; and consequently, that one day should be intercalated as usual in those years.

This correction, however, did not intirely remove the error, for the equinoxes and solstices still anticipate $1^h\ 53'\ 20''$ every four hundred Gregorian years; but that difference is so inconsiderable as not to amount to twenty-four hours, or to one whole day, in less than 5082 Gregorian years.

Pope Gregory XIII. in the year 1582, finding that the equinox had anticipated, from the above reasons, since the council of Nice held in the year 325, ten whole days, ordered that these ten days should that year be taken out of the calendar, and that the 11th of March should be called the 21st, and this method of computation was immediately followed by most foreign countries. Great Britain, however, still followed the old or Julian stile till the year 1752, during which interval one day more was anticipated. It was therefore ordered by act of parliament, that eleven days should that year be taken out of the calendar, and that the natural day following the second of September, should be called the fourteenth, omitting the intermediate eleven days, and that the new stile should for the future be observed. By this correction, the feasts and fasts of the church are now kept according to the original decision of the Nicene council.

BISTER, or rather BISTRE. See BISTRE.

BISTORTA, bistort, or snakeweed, in botany, a genus of octandrious plants. The common great bistort has a thick, oblong, jointed root, about the thickness of the finger, surrounded with bushy fibres; it is of a blackish brown colour without, and reddish within: the leaves are oblong, broad, and acuminated like the dock, but less; they are full of veins, and of a dark green colour above, and bluish underneath, standing on long pedicles, and forming a narrow margin on each side: among these arise round, slender, jointed, unbranched stalks, beset with a few smaller and narrower leaves, which have no pedicles, bearing on the top spikes of a petalous flower, consisting of a turbinated cup divided into five segments; the pistil turns to a triangular acute seed of a shining black, contained in the calyx. The root of this plant is only in use, and is said to be balsamic, vulnerary, and astringent, and therefore used against all kinds of fluxes, particularly in hæmorrhages, spitting of blood, and vomiting; it has been sometimes given in intermitting fevers, and sometimes also in small doses as a corroborant and antiseptic in acute and malignant fevers; the common dose of bistort root is from fifteen to twenty grains, and, in urgent cases, it is extended to a dram. This genus is classed by Dr. Linnæus with the polygonum. It flowers in May, and produces new spikes until August, and grows well in divers parts of England.

BISTOURY, in surgery, an instrument for making incisions, of which there are different kinds, some being of the form of a lancet, others straight and fixed in the handle like a knife, and others crooked with the sharp edge on the inside.

BISTRE, among painters, signifies the burnt oil extracted from the soot of wood.

It is of a brown transparent colour, having much the same effect in water-painting, where alone it is used, as brown pink in oil. Though this colour is extremely serviceable in water-colours, and much valued by those who know and can procure it, yet it is not in general use here, perhaps on account of its not being easily procured of a perfect kind; hardly any of it being good, except that imported from France. Perhaps the principal reason for this is, that dry beech-wood affords the best soot for making it; and it is not easy to procure such here without mixture of the soot of green wood, or other combustibles that deprave it for this purpose; or it is possible that they who have pretended to prepare it, have been ignorant of the proper means; there not being any recipe or directions in books that treat of these matters, from whence they could learn the proper process.

Bistre may, however, be prepared with great ease in the following manner.

Take any quantity of soot of dry wood, but let it be of beech where-ever that can be procured. Put it into water in the proportion of two pounds to a gallon; and boil them half an hour: then, after the fluid has stood some little time to settle, but while yet hot, pour off the clearer part from the earthy sediment at the bottom; and if on standing longer it forms another earthy sediment, repeat the same method, but this should be done only while the fluid remains hot: evaporate then the fluid to dryness; and what remains will be good bistre, if the soot was of a proper kind.

The goodness of bistre may be perceived by its warm deep brown colour, and transparency when moistened with water.

BIT, or BITT, an essential part of a bridle. Its kinds are various: 1. The mustrol, snaffle, or watering-bit. 2. The canon-mouth, jointed in the middle. 3. The canon with a fast mouth, all of a piece, only kneed in the middle, to form a liberty or space for the tongue; fit for horses too sensible, or tickliſh, and liable to be continually bear-

bearing on the hand. 4. The canon-mouth, with the liberty in form of a pigeon's neck; proper where a horſe has too large a tongue. 5. The canon with a port mouth, and an upſet or mounting liberty; uſed where a horſe has a good mouth but large tongue. 6. The ſcatch-mouth, with an upſet; ruder but more ſecure than a canon-mouth. 7. The canon-mouth with a liberty; proper for a horſe with a large tongue, and round bars. 8. The maſticadour, or ſlavering bit, &c. The ſeveral parts of a ſnaffle, or curb-bit, are the mouth-piece, the cheeks and eyes, guard of the cheek, head of the cheeks, the port, the welts, the campanel or curb and hook, the boſſes, the bolſters and rabbets, the water-chains, the ſide-bolts, bolts and rings, kirbles of the bit or curb, trench, toprol, flap, and jeive.

BIT alſo denotes the iron part of a piercer, augre, and the like inſtruments.

BIT *of a Key*, the part which contains the wards. See WARDS.

BITS, in naval architecture, ſtrong pieces of ſquare timber let down through, and fixed in holes of, the decks above and below, called mortiſes, and bolted to the beams. There are ſeveral bits in a ſhip, the principal of which are thoſe for the cable, whoſe upper parts commonly reach about three or four feet above the deck, over which the cable paſſes: they are ſupported on the forepart by ſtrong knees bolted to the deck, and fortified by a croſs-piece of equal thickneſs with themſelves, which is bolted and forelocked to the bits. The ends of the croſs-piece reach about two or three feet beyond the bits, and is fixed about two feet below their upper-ends; around theſe the cable is gradually veered away, without which it would almoſt be impoſſible to prevent it from running out to the end when the ſhip rides a great ſtrain, which is always the caſe in a ſtorm or in a rapid tide. In ſhips of war there are commonly two pair of cable bits; and when they are both uſed at once, the cable is ſaid to be double-bitted. See *Freſſin the* HAWSE, SERVICE.

To bit the cable is to put the double part or bight of it round the bits. The other bits are of a ſmaller kind for faſtening the topſail ſheets. See QUARTER-BLOCK.

BITTER, *Amarus*, an epithet given to all bodies of an oppoſite taſte to ſweetneſs.

Bitters are accounted ſtomachic and cleanſing, and are ſaid to reſiſt putrefaction, correct acidities, and aſſiſt digeſtion; though there are not wanting ſome who will have them to be hurtful to the ſtomach, except in ſo far as their aſtringency contributes to brace the fibres.

BITTER-APPLE, in botany. See COLOCYNTHIS.

BITTER-SWEET, in botany. See SOLANUM.

BITTER-VETCH, in botany. See ARODUS.

BITTERN, in ornithology, the name of a bird of the heron kind, called by authors, ardea ſtellaris; and by ſome taurus, botaurus, butorius, and ochus. In Engliſh, the butter-bump, and mire-drum. It is nearly of the ſize of a common heron; its head is ſmall and narrow; its crown is black; and there is alſo a black ſpot on each ſide, near the angle of the mouth. Its throat and ſides are reddiſh, variegated with black tranſverſe lines; the neck is covered with very long feathers, which make it appear much thicker and ſhorter than it really is; its belly is of a duſky white, with a caſt of browniſh red, and its back is variegated with a pale reddiſh brown and black. It makes a very remarkable noiſe, which it repeats either three or five times. It is heard only in the building-time, which begins in February. The common people, from the ſingularity of the noiſe, think the bird, in order to make it, ſticks its beak in a reed, or in the mud. It is commonly found in ſedgy and reedy places, near the waters, and ſometimes in hedges. Towards autumn this bird flies very high in an evening after ſun-ſet, riſing with a ſpiral aſcent, till quite out of ſight; and as they riſe, they make an odd noiſe, not at all like their uſual note. This they repeat alſo very often, as they are on the wing in the night; and hence they are called by ſome, though improperly, the night-raven. It builds on the ground, and lays five or ſix eggs, which are roundiſh, and of a greeniſh white. When wounded, and going to be taken, it ſtrikes at the perſon's eye, and ought therefore to be carefully guarded againſt.

BITTERN, in the ſalt-works, a liquor left after the boiling and cryſtallizing of the ſalt, of a nauſeous bitter taſte. It remains in the pans after the boiling is finiſhed, and is thence conveyed to a pit without the works, and at proper ſeaſons, with a ſmall addition of oil and vitriol, boiled into what is improperly called Epſom ſalt. The factitious ſal mirabile is made at the ſalt works from the ſalt that ſhoots ſpontaneouſly from the bittern.

BIVALVULAR, or BIVALVE, in botany, an appellation given to ſuch pods or capſules as conſiſt of two valves incloſing the ſeeds.

BIXA, in botany, a ſhrub which grows naturally in the warm parts of America, where it riſes with an upright ſtem to the height of eight or ten feet, ſending out many branches at the top, forming a regular head: theſe are furniſhed with heart-ſhaped leaves ending in a point, which have long footſtalks. The flowers are produced in looſe pannicles at the end of the branches; theſe are of a pale peach colour, having a double ſeries of petals, each ſeries conſiſting of five, with a great number of briſtly ſtamina, which are about half the length of the ſame colour: when the flower is decayed, the germen becomes an oval heart-ſhaped capſule, a little

little compreſſed, covered with briſtles, formed of two valves, opening at the angles, with only one cell with an interior bivalve membrane. The ſeeds are numerous and turbinated, covered with a red pulp or paſte, which colours the hands of thoſe who touch it, and is collected for the uſe of dyers and painters, by ſteeping the ſeeds in hot water, and with the hands waſhed until the ſeeds are clean; then after pouring away the water they leave the ſediment to harden, and make it up in balls, which are ſent to Europe: it is alſo uſed by the Americans to dye their chocolate; and the natives uſed to paint their bodies with it when they went to the wars. This plant is propagated by its ſeeds, but being tender it requires a hothouſe in this climate.

BLACK, a well known colour, ſuppoſed to be owing to the abſence of light; all the rays thereof being imbibed by the black bodies. See COLOUR and LIGHT.

Black bodies are not only warmer, but more inflammable than others, as is proved by various experiments; for which the curious may conſult Boyle, 'S Graveſande, and other philoſophers who have treated of this ſubject.

BLACK, among dyers, one of the five ſimple and mother colours uſed in dying. It is made differently, according to the ſeveral qualities of the ſtuffs that are to be dyed. For ſtuffs of a high price, as woollen cloth, an ell and a half, or an ell and a quarter wide, broad and narrow ratteens, fine woollen druggets, &c. they muſt uſe a black made of the beſt woad and indigo, inclining to a bluiſh brown. The goodneſs of the compoſition conſiſts in there being not above ſix pounds of indigo ready prepared to each ball of woad, when the latter being in the tub, begins to caſt its blue flower; and in not being heated for uſe above twice; after which it muſt be boiled with alum, tartar, or aſhes of lees of wine; then maddered with common madder; and laſtly, the black muſt be given with gall-nuts of Aleppo, copperas, and ſumach. As for more indifferent ſtuffs, ſuch as ſmall ratteens and ſhalloons, as they cannot pay for the expence of maddering, it is ſufficient that they be well boiled with woad, and afterwards blacked with gall and copperas. There is likewiſe the Jeſuit's black, which is made with the ſame ingredients as the good black, but without having firſt dyed the ſtuff blue.

German BLACK, called by ſome Frankfort black, is made with the lees of wine, burnt, waſhed afterwards in water, then ground in mills made for that purpoſe, with ivory, bones, or peach-ſtones, alſo burnt. It comes from Frankfort, Mentz, and Straſbourg, either in lumps or powder, and muſt be choſen moiſt, without having been wetted, of a fine ſhining black, ſoft, friable, light, and with as few ſhining grains as poſſible.

Bone-BLACK is made with the bones of oxen, cows, &c. and is uſed in painting; but is not ſo much eſteemed as ivory-black.

Hart's BLACK, that which remains in the retort after the ſpirits, volatile ſalt, and oil, have been extracted from hart's-horn. It anſwers the purpoſes of painters almoſt as well as ivory-black.

Spaniſh BLACK is nothing but burnt cork; it is uſed in ſeveral works. It ſhould be light, and have as few grains of ſand mixed with it as poſſible.

Earth-BLACK, a ſort of coals found in the ground, which the painters and limners uſe to paint in freſco, after it has been well ground.

There is alſo a black made with gall-nuts, copperas, or vitriol, ſuch as common ink: and a black made with ſilver and lead, which ſerves to fill up the cavities of engraved things.

Lamp-BLACK is the ſoot of oil collected as it is formed by burning. It is a browniſh black; but nevertheleſs, being of a good texture for mixing either with oil or water, and drying well with oil, it is the principal black at preſent uſed in all nicer kinds of painting: for notwithſtanding ivory-black far ſurpaſſes this in colour, the groſs and adulterate preparation of all that is to be now obtained has occaſioned it to be greatly rejected.

The lamp-black is made by burning oil in a number of large lamps in a confined place, from whence no part of the fumes can eſcape; and where the ſoot formed by theſe fumes, being collected againſt the top and ſides of the room, may be ſwept together and collected: and this being put into ſmall barrels, is ſold for uſe without any other preparation.

The goodneſs of lamp-black lies in the fullneſs of the colour, and the being free from duſt or other impurities. The lightneſs of the ſubſtance furniſhes the means of diſcovering any adulteration if to a great degree; as the bodies with which lamp-black is ſubject to be ſophiſticated are all heavier in a conſiderable proportion.

Ivory-BLACK is the coal of ivory or bone, formed by giving them a great heat, all acceſs of air to them being excluded. It is, when pure and genuinely prepared from the ivory, a full clear black; and would be the moſt uſeful of any, in any kind of painting, but that it is apt to dry ſomewhat too ſlowly in oil. At preſent, nevertheleſs, being prepared only by thoſe who manufacture it from bones in very large quantities for coarſe uſes, and ſell it at an extreme low price, it is ſo groſsly levigated, being ground only in hand or horſe-mills, and adulterated moreover copiouſly with charcoal duſt, which renders it of a blue caſt, that it is wholly exploded from all more delicate purpoſes, and lamp-black uſed in the place of it, though inferior, with regard to the purity and clearneſs of the black colour, to this when good. As the ivory-black, notwithſtanding, has its merit in moſt kinds of painting,

painting, when its preparation is properly managed, particularly in water and varnish; those who desire to have it may prepare it themselves in perfection by the following means.

Take plates, chips, or shavings of ivory, and soak them in hot linseed oil; or if filings are to be more easily procured, they may be used moistened with the hot oil: put them into a vessel which will bear the fire, covering them with a sort of lid made of clay and sand, which should be dried, and the cracks repaired before the vessel be put into the fire. Procure this vessel to be placed in a tobacco-pipe maker's or potter's furnace, or any such fire; and let it remain there during one of their heats. When it shall be taken out, the ivory will be burnt properly; and must be afterwards thoroughly well levigated on the stone with water; or it should, indeed, to have it perfectly good, be also washed over.

Those who have a calcining furnace, may very commodiously burn the ivory in it; and the fire need not be continued longer than while the fumes, that arise from the vessel containing the ivory, appear to flame. This operation may likewise be performed in a subliming furnace, by putting the ivory in a retort, coated with the fire-lute, and fixing the retort for the sublimers; and a proper receiver being fitted to the receivers, the fumes will be detained in it, and the smell prevented from being in the least troublesome: the fire must in this case be continued while any gross fumes come over.

The goodness of ivory-black may be perceived by its full black colour, not inclining too much to blue; and by its fineness as a powder.

Blue-BLACK is the coal of some kind of wood, or other vegetable matter, burnt in a close heat where the air can have no access. The best kind is said to be made of vine stalks and tendrils: but there are doubtless many other kinds of vegetable substances from which it may be equally prepared. It is, when good, a fine bluish black colour, useful in most kinds of paintings for many purposes; but is rarely to be had at present well prepared; and, therefore, much neglected in most nicer cases.

Those who desire to have blue-black perfectly good, may prepare it in the manner above directed for the ivory-black, from the vine stalks or tendrils, or any other twigs of wood of an acid taste and tough texture; but the soaking in oil, prescribed for the ivory, must be here omitted.

The goodness of the blue-black consists in the cleanness and blue cast of its black colour; and the perfectness of its levigation, which should be managed as directed for the ivory-black.

Currier's BLACK signifies a teint or dye laid on tanned leather; of which there are usually two, the first made of galls, sour ale, and old iron; the second of galls, copperas, and gum-arabic.

BLACK-BIRD, *Merula*, in ornithology. See the article MERULA.

BLACK *Land*, in agriculture, a term by which the husbandmen denote a particular sort of clayey soil, which, however, they know more by its other properties than by its colour, which is rarely any thing like a true black, and often but a pale grey. This, however pale when dry, always blackens by means of rain; and when plowed up at those seasons, it sticks to the plow-shares; and the more it is wrought, the muddier and duskier-coloured it appears. This sort of soil always contains a large quantity of sand, and usually a great number of small white stones.

BLACK *Flux*, in minerology, a flux used in the assaying of ores, and is made as follows:—Take one part of nitre, and two parts of common tartary; reduce each to powder, mix them together, and deflagrate the whole in a crucible, by lighting the mixture at the top; which thus turns to a kind of alkaline coal, that is to be pulverized and kept in a close glass, to prevent its dissolving, as it would do in a moist air.

This flux is of general use; and to have it ready at hand, shortens the business of making assays in metallurgy, and renders the operation more exact than when crude tartar and nitre are employed; because the deflagration might thus carry off some part of the ore, and defraud the account: for the same reason the mixture is here directed to be fired at top, otherwise a considerable part might be lost in the deflagration, which would prove much more tumultuous and violent, if the matter was thrown into a red-hot crucible. *Shaw's Chem. Lectures.*

BLACK *Tin*, in minerology, a denomination given to the tin-ore when dressed, stamped, and washed ready for the melting-houses, where it is refined into a pure metal.

It is prepared into this state by means of beating and washing; and when it has passed through several baddles or washing-troughs, it is taken up in the form of a black powder like fine sand, called black-tin.

BLACK, in heraldry, is called sable. See the article SABLE.

BLACK, in horsemanship. Black horses are very beautiful, especially when they are of a jet shining black, and well marked, and have not too much white: for as a great deal of white, especially when it spreads round their eyes, and a great way up their legs, adds nothing to their beauty, so neither does it add any thing to their goodness. The English black horses have more white than the black horses of any other country. I have known many fine Spanish horses, some Arabs, and one Egyptian, the only one I ever saw of that country, all without any white; and the Dutch and Danish horses seldom have much; though a star of blaze, and sometimes a white muzzle, and one or more of the feet tipped with white, always looks beautiful and lively, and is no diminution to the good-

goodneſs of a horſe, but moſt think an addition, from an opinion that horſes without any mark are generally ſtubborn and ill-conditioned. Some black horſes have brown muzzles, are browniſh on their flanks and between their hips: theſe are often called black browns, as they are not a perfect black, but approach near to the colour of a tawny black hound: ſome are of a lighter colour about their muzzles, and are called mealy-mouthed horſes; and of this ſort are the pigeon-eyed horſes, which have a white circle round their eye-lids, and their fundaments often white. But after all, I have found many of the Engliſh black horſes, eſpecially of the largeſt breed, not ſo hardy as the bays and cheſnuts, &c. Thoſe that partake moſt of the brown, are generally the ſtrongeſt in conſtitution. *Gibſon on Horſes.*

BLACK-BERRY, in botany. See RUBUS.

BLACK-BOOK *of the Exchequer*. See the article EXCHEQUER.

BLACK-STRAKES, in the marine, thoſe planks which are ſituated immediately above the bends of a ſhip (ſee the article BENDS): they are always covered with tar and a mixture of lamp-black, and form a beautiful variety with the white bottom below, and the ſcraped planks, covered with turpentine, or varniſh of pine, above.

BLACKNESS, the quality of a black body, or a colour ariſing from ſuch a texture and ſituation of the ſuperficial parts of the body, as does deaden, or rather abſorb the light falling on it, without reflecting any, or very little to the eye. Sir Iſaac Newton in his Optics ſhews, that for the production of black colours, the corpuſcles muſt be leſs than thoſe which exhibit any other colours; becauſe where the ſizes of the component particles are greater, there is too much light reflected, to conſtitute this colour: but if there be a little leſs than is requiſite to reflect the white, and very faint blue of the firſt order, they will reflect ſo little light as to appear intenſely black, and yet may perhaps reflect it variouſly to and fro within them ſo long till it happen to be ſtifled and loſt; by which means they will appear black in all poſitions to the eye, without any tranſparency.

BLADDER, *veſica urinaria*, in anatomy, a kind of membraneous and fleſhy pouch or bottle, capable of dilatation and contraction, ſituated in the lower part of the abdomen, immediately behind the ſymphyſis of the oſſa pubis, and oppoſite to the beginning of the inteſtinum rectum. The figure of it is nearly that of a ſhort oval, It is broader on the fore and back ſides than on the the lateral parts; rounder above than below, when empty; and broader below than above, when full.

It is divided into the body, neck, and bottom; into an interior, poſterior, and two lateral parts. The upper part is termed the fundus or bottom, and the neck is a portion of the lower part, which is contracted like the gullet of ſome veſſels.

The bladder is made up of ſeveral coats, almoſt like the ſtomach. That part of the external coat which covers the upper, poſterior, and lateral ſides of the bladder, is the true lamina or membrane of the peritonæum; and the reſt of it is ſurrounded by a cellular ſubſtance, by the intervention of which the peritonæum is connected to the muſcular coat.

The proper coats are three in number, one muſcular, one nervous, and one villous, which is the innermoſt. The muſcular coat is compoſed of ſeveral ſtrata of fleſhy fibres, the outermoſt of which are moſtly longitudinal; the next to theſe are more inclined toward each hand; and the innermoſt more and more oblique, and they become at length almoſt tranſverſe. All theſe fibres interſect each other in various manners, and they are connected together by a fine cellular ſubſtance, and may be ſeparated by inflating that ſubſtance.

The nervous coat is nearly of the ſame ſtructure with the tunica nervoſa of the ſtomach.

The internal coat is ſomething granulated and glandular, and a mucilaginous ſerum is continually diſcharged through it, which moiſtens the inner ſurface of the bladder, and defends it againſt the acrimony of the urine. It appears ſometimes altogether uneven on the inner ſide, being full of eminences and irregular rugæ when empty, and in its natural ſtate of contraction. Theſe inequalities diſappear when the bladder is full, or when it is artificially diſtended by air, or by injecting any liquid.

The external fibres of the muſcular coat are more numerous than the internal; and the moſt longitudinal anterior fibres form a kind of incurvation round the urachus at the top of the bladder, much like that of one of the fleſhy portions which ſurround the ſuperior orifice of the ſtomach, and lower extremity of the œſophagus. This incurvation paſſes behind the urachus.

The portion of the peritonæum which covers the poſterior convex ſide of the bladder, forms a very prominent tranſverſe fold, when the bladder is contracted, which diſappears when the bladder is extended. This fold ſurrounds the poſterior half of the bladder, and its two extremities are elongated toward each ſide, by which elongations a kind of lateral ligaments of the body of the bladder is formed, which are more conſiderable in children than in adults.

The lower part of the bladder, which deſerves the name of fundus much better than the upper part, is perforated by three openings, one anterior and two poſterior. The anterior opening is formed by an elongation of all the proper coats, in form of a gullet, turned much in the ſame manner with the

the inner orifice of the roſtrum of the head of an alembic. This elongation is called the neck of the bladder.

The other two openings in the true fundus of the bladder are formed by the ureters, which, in their courſe downward, run behind the ſpermatic veſſels, and then behind the lower part of the bladder, approaching near each other. See URETERS.

Each ureter lies between the umbilical artery and vas deferens of the ſame ſide; the artery lying on the outſide of the ureter, and the vas deferens on the inſide.

Afterwards they get between the vaſa deferentia and the bladder, croſſing theſe canals; and then, at about a finger's breadth from each other, they begin to pierce the coats of the bladder. They run a little way between the muſcular and nervous coats, and open into the bladder obliquely, ſomething nearer each other than when they firſt entered its coats.

The orifices of the ureters in the bladder are ſomething oval and narrower than the cavity of the ureters immediately above them. The edge of theſe orifices is very thin, and ſeems to be formed merely by the union of the internal coat of the bladder with that of the ureters.

The arteries of the bladder are furniſhed by the hypogaſtricæ or iliacæ internæ; being rami of the arteria ſciatica, epigaſtrica, and umbilicalis, on each ſide. The veins come from thoſe of the ſame names with the arteries.

The nerves of the bladder come from the crurales, and alſo from the ſympathetici maximi, by means of their communication with the crurales. It has likewiſe ſome nerves from the plexus meſentericus inferior. *Winſlow's Anatomy.*

The diſeaſes of the bladder are the ſtone, inflammations, ulcers, &c. See the article STONE, &c.

For the other bladders of the body, ſee the article VESICULA.

Air-BLADDER, in phyſiology. See the article AIR-*Bladder*.

BLADDER-NUT, in botany. See STAPHYLÆA.

BLADDER *Sena*, in botany. See COLUTEA.

BLADE, in botany, that part of the flower, or florid attire of a plant, which ariſes out of the concave of the ſheath, and, at the top, uſually divides into two parts, which are covered with globules of the ſame nature as thoſe of the apices, but not ſo copious.

The blade runs through the hollow of the ſheath and baſe, and is faſtened to the convex of the ſeed-caſe, having its head and ſides beſet with globules, which through a glaſs appear like turnip-ſeeds, and which, in ſome plants, grow cloſe to foot ſtalks. Theſe globules, as the blade ſprings up from within the ſheath, are ſtill rubbed off, and ſo ſtand like a powder on both. In ſome plants, as knap-weed, they ſeem alſo to grow on the inſide of the ſheath, as appears on ſplitting it with a pin. The head of a blade is divided uſually into two; but ſometimes, as in cichory, into three parts, which, by degrees, curl outward, like ſcorpion-graſs.

BLADE, in commerce, a thin ſlender piece of metal, either forged by the hammer, or run and caſt in moulds, to be afterwards ſharpened to a point, edge, or the like.

BLAFART, in commerce, a ſmall coin, current at Cologn, worth ſomething more than a farthing of our money.

BLAIN, among farriers, a diſtemper incident to beaſts, being a certain bladder growing on the root of the tongue, againſt the wind-pipe, which ſwells to ſuch a degree, as to ſtop the breath. It comes by great chafing and heating of the ſtomach, and is perceived by the beaſt's gaping and holding out his tongue, and foaming at the mouth: to cure it, caſt the beaſt, take forth his tongue, and then ſlitting the bladder, waſh it gently with vinegar and a little ſalt.

BLANCHING, in general, implies the art of bleaching or whitening. See BLEACAING.

BLANCHING of copper is done various ways, ſo as to make it reſemble ſilver. If it be done for ſale, it is felony, by 8 and 9 William III. ch. xxvi.

BLANCHING, in coinage, the operation performed on the planchets or pieces of ſilver, to give them the requiſite luſtre and brightneſs. They alſo blanch pieces of plate, when they would have them continue white, or have only ſome parts of them burniſhed.

Blanching, as it is now practiſed, is performed by heating the pieces on a kind of peel with a wood-fire, in the manner of a reverberatory; ſo that the flame paſſes over the peel. The pieces being ſufficiently heated, and cooled again, are put ſucceſſively to boil in two pans, which are of copper: in theſe they put water, common ſalt, and tartar of Montpelier. When they have been well drained of this water in a copper ſieve, they throw ſand and freſh water over them; and when dry, they are well rubbed with towels.

BLANCAING, among gardeners, an operation whereby certain plants, &c. are rendered whiter, and more tender, than otherwiſe they would be. One operation is, by tying the leaves up cloſe; this is practiſed on cabbages, lettuces, &c. in the ſummer, which makes them fit for uſe conſiderably ſooner, and particularly thoſe which are not inclinable to turn in, or cabbage, as the gardeners term it. Another method practiſed, in winter on cellery, endive, dandelion, &c. is by earthing them up to their tops, which not only blanches, but alſo protects them from the froſts. The operation for ſo doing, ſee under their reſpective articles.

BLANCHING alſo denotes the operation of covering iron plates with a thin coat or cruſt of tin.

BLANK,

BLANK, or BLANC, properly ſignifies white. See WHITE.

BLANK, in commerce, a void or unwritten place which merchants ſometimes leave in their day-books or journals. It is alſo a piece of paper, at the bottom of which a perſon has ſigned his name, the reſt being void. Theſe are commonly intruſted into the hands of arbiters, to be fitted up as they ſhall think proper, to terminate any diſpute or law-ſuit.

BLANK-BAR, in law, the ſame with common bar. See the article BAR.

BLANK-TICKETS, in lotteries, thoſe drawn without any prize.

BLANK-VERSE, in the modern poetry, that compoſed of a certain number of ſyllables, without the aſſiſtance of rhyme. See the articles VERSE and RHYME.

Point-BLANK. See POINT-*Blank*.

BLANKET, a coverlet for a bed: a ſtuff commonly made of white wool, and wrought in a loom like cloth; with this difference, that they are croſſed like ſerges.

When they come from the loom, they are ſent to the fuller; and after they have been fulled and well cleaned, they are napped with a fuller's thiſtle.

There are alſo blankets made with the hair of ſeveral animals, as that of goats, dogs, and others.

The manufacture of blankets is chiefly confined to Witney in Oxfordſhire, where it is advanced to that height, that no other place comes near it. Some attribute a great part of the excellency of the Witney blankets to the abſterſive, nitrous water of the river Windruſh, wherewith they are ſcoured; others rather think they owe it to a peculiar way of looſe ſpinning, which the people have thereabouts. Be this as it will, the place has engroſſed almoſt the whole trade of the nation for this commodity; inſomuch that the wool fit for it centers here from the furthermoſt parts of the kingdom. There are ſaid to be at leaſt ſixty blanketers in that town, who, amongſt them, have at leaſt one hundred and fifty looms, and employ three thouſand perſons, from children of eight years old, who work out about a hundred packs of wool per week.

BLANQUILLE, in commerce, a ſmall ſilver coin, current in the kingdom of Morocco, and all that part of the coaſt of Barbary. It is worth about three halfpence of our money.

BLASPHEMY, an indignity or injury offered to the Almighty, by denying what is his due, and of right belonging to him; or by attributing to the creature that which is due only to the Creator.

BLAST, in a general ſenſe, denotes any violent exploſion of air, whether occaſioned by gun-powder, or by the action of a pair of bellows.

BLASTS, among miners, the ſame with damps. See the article DAMP.

BLAST, or BLIGHT, in huſbandry. See BLIGHT.

BLASTING, a term uſed by miners for the tearing up rocks, which lie in their way, by the force of gunpowder.

In order to do this, a deep hole is made in the rock, which being charged with gunpowder, they fill it up; leaving only a touch-hole, with a match to fire the charge.

BLAZE, a white ſpot in a horſe's face.

BLAZING-STAR, the ſame with comet. See the article COMET.

BLAZONING, or BLAZONRY, in heraldry, the art of decyphering the arms of noble families.

The word originally ſignifies the blowing or winding of a horn, and was introduced into heraldry as a term denoting the deſcription of things borne in arms, with their proper ſignifications and intendments, from an ancient cuſtom the heralds, who were judges, had of winding an horn at juſts and tournaments, when they explained and recorded the atchievements of knights.

In blazoning a coat of arms, you muſt always begin with the field, and next proceed to the charge; and if there be many things borne in the field, you muſt firſt name that which is immediately lying upon the field. Your expreſſions muſt be very ſhort and expreſſive, without any expletives, needleſs repetitions, or particles. Such terms for the colours muſt be uſed, as are agreeable to the ſtation and quality of the bearer. All perſons beneath the degree of a noble, muſt have their coats blazoned by colours and metals; noblemen by precious ſtones, and kings and princes by planets.

BLEA, in the anatomy of plants, the inner rind or bark. It may be conſidered as an aſſemblage of ſtraight fibres ranged vertically and parallel to one another.

While the blea remains any thing ſoft, and retains ſomewhat of the nature of bark, it may maintain a feeble vegetation; but when it is grown abſolutely hard and woody, it can no longer contribute thereto.

BLEACHING, the art or method of whitening linens, ſtuffs, ſilks, hair, wax, &c.

This art, or rather the different proceſſes in which it conſiſts, being of the utmoſt importance to ſeveral manufactures, the reader will not, we preſume, be diſpleaſed to find it explained in a particular and intelligent manner.

The proper materials for bleaching either linen yarn, or cloth, are wood-aſhes brought from Muſcovy and Germany, and Caſſoup, alſo a ſort of aſhes imported from Dantzick. But the common wood-aſhes and weed-aſhes made in this kingdom, are as good as the beſt, unleſs it be for bleaching cloth of a very high price. He that would bleach well,

well, must be provided with a convenient bleaching-yard, bleaching-house, and all things suitable; for shifts in trade fail in the event. He ought to have his bleaching-yard well watered. The nature of the water ought to be soft, such as will break sope. The yard ought to be so situated, as that in the drought of summer the trenches and pipes may be constantly supplied. As for the bleaching-house, it ought to be furnished with good coppers and boilers, good tubs for bucking, and also stands and vats for keeping the several sorts and degrees of lyes, and other great stands and vats for keeping the milk, or acidulated liquor.

In the bleaching of your yarn, you must first open each bank, and lay it in your bucking-tub; then cover your yarn with cold water, and let it steep for about nine hours: therefore let go that water by means of a cock, which ought to be fixed near the bottom of your tub; and then fill it again with water. Continue thus to steep and cleanse your yarn from its filth, till such time as you perceive that the water is no way foul that comes from it: then withdraw your yarn out of your tub, and rinse it well in clean water. After rinsing it, you must wring out all the water, by wringing three or four hanks at a time: then lay it out to dry in your bleaching-yard; but be sure never to beat or beetle it. By the time your yarn is perfectly dry, you are to be provided with lye proper for bucking. The first bucking you give your yarn, ought to be with your strongest lye. Your yarn being quite dry, you must dip three or four hanks at a time, and lay them in your bucking-tub, in the most equal and even manner that possibly you can; never pressing them too much, to the end the lye may the better pierce and penetrate them. All your yarn being thus laid in your tub, put the remainder of your lye, in which you dip your yarn, into a pot or pan, and make a slow fire under it, taking care not to heat your lye so for the first five hours, whilst you are thus bucking, but that you may be able to endure your hand in it. Your fire made, you must very often take out some of your lye, and pour it upon your yarn in your tub; then you must increase your fire gradually and slowly, so as in four hours time more to bring your lye to boil: during all which time, you must continue to take your lye out of your copper, and put it into your tub by small quantities at a time. When your lye begins to boil, you must let it boil on for three hours, during the whole time lading or pouring your lye out of your copper into your tub; so that you will be twelve hours bucking your yarn. If your lye was strong and good, your yarn will be brought to a yellow colour, if the improper preparing of some flax does not hinder it: but where you find your yarn, or part of it, does not attain to this yellow colour, you must repeat bucking until it answers your ends. When your yarn is sufficiently bucked for your purpose, you must take it out, rinse it in cold water, and wring it well; taking care to wring but three or four hanks at a time, that it may the better endure the labour. Be sure never to beat or beetle it, as hath been already observed. Then spread it out in your bleaching-yard; where it must lie exposed to the weather for three or four days before you turn it. When that time is over, turn it, and let it lie there till the side that is undermost be as good a colour as the other. You must water yarn on the bleaching-yard as you do cloth, that it may whiten the sooner, and lie the shorter time upon the green. This bleaching which was just now prescribed to be given to your yarn, is not intended to make it very white, but chiefly to cleanse it from the filth that is incident to it, that your cloth may be the thicker and stronger, and with more ease brought to a colour when it comes to be bleached. Wherefore bleach your yarn for all kinds of cloth, except cambricks and lawns, the yarn whereof should not be bleached before it be woven.

BLEACHING *of Linen Cloth.* In order to perform this operation, you must begin with it as you did with your yarn, by steeping it in cold water in your tub for nine hours; then change the water on it, till such time as you can perceive that the water is no longer discoloured; rinse, wring, and lay it out to bleach, observing constantly to water it so as never to suffer it to be too dry. When it hath lain three or four days thus on the grass, and is dry, you must take hold of each piece, one after another, by the selvedge, and draw the cloth to you, still holding it in the most even manner that you can, until you come to the farther end, with the corners of which you tie your cloth very loosely in the middle of the folds, and so lay it in your bucking-tub, with the two selvedges upwards. This you must do until you have placed as much cloth in your tub as will cover the bottom of it, taking care not to pack the cloth so close but that your lye may penetrate to all parts equally; and at the same time you must observe, never, if possible, to buck your cloth but when it is very dry. When you have laid the first range of cloth in your tub, you must pour as much milk-warm lye on it as will sufficiently soak through all all parts of your cloth. Then you must lay another range in the same manner as you did the first; pour on more lye until that be soaked as the other was; and continue to do so till your tub be full. That done, you must begin to buck for twelve hours together, observing the directions, in relation to the fire, given for the former article. Your two first buckings ought to be of very strong lye; but afterwards you should abate of that strength in proportion as your cloth grows nearer to its perfection of whiteness, lest you make it rotten

and unſerviceable by over-ſtrong lye. After each bucking you muſt carry it ſtraight to the bleaching-yard, where it ought to lie forty-eight hours. This you muſt perform ſucceſſively as many times as you ſee occaſion, according to the nature of the cloth, from the buck to the bleaching-yard, and from the bleaching-yard to the buck, before you begin to uſe it with milk; ſtill giving it weaker lye after the two firſt buckings, and conſtantly obſerving to water your cloth on the graſs, ſo as never to ſuffer it to be dry during theſe bleachings. It is impoſſible to preſcribe a certain rule, or to direct the preciſe number of buckings that ought to be given to cloth, becauſe that depends on the ſorts or kinds you are to bleach; and therefore the experience and judgment of the bleacher muſt guide him therein. Your thin fine cloths will bleach much ſooner than your coarſe or ſtiff ſtubborn cloths will do: but both ſorts muſt be dry when you put them into the milk; or which will anſwer the ſame purpoſe, a quantity of water rendered acid by oil of vitriol, in the proportion of half an ounce of the latter to a gallon of the former.

The milking of cloth, or laying it in an acidulated liquor, was not uſed till of late; but it is found by experience to contribute greatly to bring cloth to a good colour. It has been already obſerved, that you muſt have large tubs or vats for the keeping of your milk. Theſe vats, which ſhould hold a ton or two a-piece, you ought to keep full of butter-milk, or ſour milk, as it is commonly called, ſkimmed milk, whey, and the like, mixed together; there to ſtand and ſour until you have occaſion to uſe them. It is very rare that your milk proves too ſour; but if at any time it ſhould, abate its ſourneſs by adding cold water. When your cloth is dry, and ready to be milked, have a great tub with milk ſet half-way in the ground. Your cloth being well ſoaked therein, you muſt preſs it down with heavy planks or weights, ſo as it may not be raiſed by the fermentation that will be in your milk or acid liquor. When the cloth has lain a-while, take care that theſe weights be ſufficient; and that your planks be neither of new oak or alder, for thoſe woods ſpoil and ſtain cloth very much, as will alſo ſeveral ſorts of ſtones, if laid upon cloth either in the tubs or in the field. Thus your cloth muſt ſteep for at leaſt forty-eight hours; or, if you pleaſe, for three days and three nights; for it will be ſo much the better for the cloth: then ſpread it on the green, and water it well, to prevent its drying with the milk or acid in it: when this is ſufficiently done by watering, you muſt rinſe the cloth, and waſh it well with a lather of ſope. Your next buſineſs is to buck the cloth again juſt as it comes from the ſope-ſuds; and when bucked, you muſt, without further rinſing, ſpread it on the graſs in your bleaching-yard: there it muſt remain expoſed to the air for two days and two nights, and be conſtantly watered in the day-time, when you lay it out to bleach. This operation muſt be repeated ſix, ſeven, or eight times ſucceſſively, until you perceive your cloth is come to the colour you deſire to give it; that is, you muſt milk, then bleach, then waſh, then ſope, and buck by turns, until you attain your end; for it is impoſſible to propoſe a certain rule, becauſe of the great variety of cloth: only this muſt be obſerved, that each time you buck, you muſt ſpend twelve hours, during all which time you ought to be conſtantly lading or pouring the lye into your tub, according to the former directions; for otherwiſe you may chance to burn your cloth, eſpecially when the lye grows hot. This rule is alſo conſtantly to be obſerved, that your cloth be very dry when you lay it in the milk or acid liquor. This laſt time you milk your cloths, you ought, inſtead of the uſual waſhing or rinſing, to lay them in an open ciſtern; where people with clean feet ſhould tread them very well for half an hour at leaſt. That done, waſh them with clean water, until you perceive the fluid to be no way diſcoloured: then having made your bucking-tub very clean, lay your cloths in it juſt as you did at firſt, and ſteep them in warm water for an hour: then let go that water, and ſteep them a ſecond time in water ſomewhat warmer, for an hour longer: let that water go likewiſe, and ſteep your cloths a third time in water yet warmer than the former; but not ſo hot as to boil. This laſt ſteeping need not be near ſo long as the preceding; half an hour is ſufficient. Then take out your cloth, rinſe and wring it well, that it may be cleanſed from the lye, milk, or acid liquor, and ſope, and made more ſuſceptible of receiving the ſtarch and blue; which is the next operation.

It is impoſſible to preſcribe a certain rule for preparing of ſtarch to dreſs your cloth, becauſe of the great variety of cloths which muſt be made: fine thin cloths require a thicker and more ſubſtantial ſtarch than coarſer cloths do; therefore it is requiſite that bleachers ſhould have ſome experience and knowledge therein. Every laundreſs knows how to make ſtarch, and prepare it for the beautifying of her linen: but the ſtarch made uſe of in this trade is much thinner than theirs. The way to make it is this: Fill the boiler or pan, wherein you deſign to make your ſtarch, about three quarters full of water; when the water boils, pour into it as much ſtarch diſſolved in water, as will compleatly fill your boiler; keep it ſtirring perpetually, leſt it burn, and let it boil for half an hour, or thereabouts; then take it off the fire, ſtrain it into another veſſel with warm water, in proportion to the cloth you deſign to dreſs, taking great care to keep it ſtirring, breaking, and diſſolving the clods of ſtarch, that the whole may be of an equal thickneſs or conſiſtency. When this part of

the

the operation is finiſhed, mix powder blue in water, in ſuch proportion as you would give your cloth a higher or a lower colour, and add it to your ſtarch prepared as above. By this means you may make your ſtarch thicker or thinner, as you think will be beſt adapted to your cloth. Take great care never to uſe indigo, or ſtone-blue; becauſe it gives a dull dark colour.

When you have thus prepared your water for ſtarching and bluing, put your cloth into it; and when it is well ſoaked, take it out, wring it very hard, and ſpread it on the graſs in your bleaching-yard to dry. You will generally find that the blue will ſettle in ſome parts of your cloth more than in others: in which caſe you muſt, with a clean cloth wet in water, rub ſuch parts till you bring them down to the colour they ought to have. Your cloths being now well ſtarched and blued, according to the circumſtances or nature thereof, and being very dry, either fold them up yourſelf, or ſend them to a lapper.

BLEACHING *of Hair* is done by ſpreading the hair to be bleached upon the graſs, in the ſame manner as linen, after it has been firſt waſhed out in a lixivious water.

This lye, with the force of the ſun and air, brings the hair to ſo perfect a whiteneſs, that the moſt experienced perſon may be deceived therein; there being ſcarce any way of detecting the artifice, but by boiling and drying it; which leaves the hair of the colour of a dead walnut-tree leaf.

BLEACHING *of Silk*. The ſilk, being yet raw, is put into a linen bag, and thrown into a veſſel of boiling river water, in which ſope has been diſſolved, and thus boiled for two or three hours; the bag being turned ſeveral times, taken out and beaten, then waſhed out in cold water, and wrung out ſlightly, and thrown into a veſſel of cold water, mixed with ſope and a little indigo.

The indigo gives it the bluiſh caſt that is obſervable in white ſilks.

When it has been taken out of the ſecond veſſel, it is wrung out, and all the water and ſope ſqueezed out, ſhook out to untwiſt and ſeparate the threads, and hung up in the air in a kind of ſtove, made on purpoſe, in which ſulphur is burnt, the vapour of which gives the laſt degree of whiteneſs to the ſilk.

BLEACHING *of Woollen Stuffs*. There are three methods of whitening woollen ſtuffs; the firſt is with water and ſope, the ſecond is with vapour of ſulphur, the third with chalk, indigo, and vapour of ſulphur.

For the firſt, when the ſtuffs are come from the fulling-mill, they are to be put into ſoped water pretty hot, and worked afreſh by force of arms over a bench, which finiſhes the whitening which the fulling-mill had begun; in the laſt place they are to be waſhed out in fair water and dried; this is called the natural way of bleaching.

The ſecond method is what is commonly called bleaching by the flower; the ſtuff is firſt waſhed in river water, and then put to dry on poles, and when it is half dry, ſpread out in a kind of ſtove, wherein ſulphur is burnt, the vapour of which diffuſing itſelf, ſticks by little and little over all the ſtuffs, and gives it a fine whitening.

The third method is thus; After the ſtuffs have been waſhed, they are to be thrown into cold water, impregnated with chalk and indigo, in which they are well agitated: they are waſhed afreſh in elder water, then half dried on poles, and then ſpread in a ſtove to receive the vapour of the ſulphur, which finiſhes the bleaching.

This is to be remembered, that when a ſtuff has once received the ſteam of ſulphur, it will ſcarce receive any beautiful dye, except black and blue.

BLEACHING *of Wax*, the operation of changing the colour of the yellow into a beautiful white: it is done in the following manner.

The common yellow wax is firſt reduced into ſmall grains, by melting it, and throwing it while hot into cold water, or ſpreading it into very thin cakes. The wax thus granulated or flatted, is placed in the open air on linen cloths, where it remains night and day, it being neceſſary that it be expoſed both to the rays of the ſun, and the influence of the dew. After thus lying a conſiderable time, it is again melted and granulated, or flattened into cakes, and once more expoſed to the action of the ſun and dew. Theſe operations are alternately performed till the wax has acquired the requiſite degree of whiteneſs.

When the ſun and dew have perfectly bleached the wax, it is melted for the laſt time, taken out of the copper with a ladle, and poured, by means of a double funnel, into ſhallow moulds or round cavities formed in a board, the moulds being previouſly wetted with cold water, that the wax may not ſtick to them; and in this manner the cakes of white wax we ſee in the ſhops are made. Theſe cakes are then taken out of the moulds, and again expoſed to the action of the air, dew, and ſun, for two days and two nights, in order to dry them thoroughly, and render them more tranſparent.

BLEEDING, or BLOOD-LETTING, the operation of taking blood from any part of the body, either by the lancet, leeches, or cupping. See PHLEBOTOMY, CUPPING, &c.

Dr. Pringle obſerves, that bleeding is the moſt indiſpenſable of all remedies in inflammatory diſeaſes; to the delaying of which too long, or not repeating it, are chiefly owing the bad conſequences of colds, as well as dangerous fevers, rheumatiſms, and conſumptions. He obſerves farther, that, in general, young practitioners are apt to be too ſparing letting blood, by which means many lives are loſt: for a ſurgeon

may be assured a soldier will never complain of a cough, or pains with inflammatory symptoms, wherein bleeding is not necessary; and from the sizeness of the blood, and continuance of the complaints, he is to judge of the necessity of repeating it, which, in case of a stitch, or difficult breathing, is never to be delayed. In inflammatory cases, from twelve to fifteen ounces may be taken for the first bleeding, and somewhat less for all the rest; and when it is necessary to exceed this quantity, it may be proper to follow Celsus's rule, in minding the colour of the blood whilst it flows, and when it is of a blackish cast, which is always the case in difficult breathing and great inflammations, to let it run till it becomes more florid. In all cases where plentiful bleeding is indicated, it is best to do it in bed, to prevent fainting: and we may observe, that a person will bear the loss of a much greater quantity of blood, if the stream is small, than by a large orifice, which some have thought necessary for making a more speedy revulsion.

Bleeding is highly necessary in the phrenitis, ophthalmia, quinsy, rheumatism, cough, hectic fits, and, in general, in all inflammatory cases. *Pringle's Observ. on the Diseases of the Army.*

It is to be observed, however, that, in malignant and putrid disorders, bleeding frequently renders them more malignant, and therefore to be omitted, or at least not repeated, unless there appear evident marks of inflammations.

Bleeding *at the Nose*, an hæmorrhage from that organ of the body, owing to the more plentiful appulse of blood to the nostrils by a stronger motion of the heart, whereby the small arteries in the pituitary coat become turgid, and too much distended, till at length they gape, and the blood rushes out.

If the bleeding is very inordinate, it will be proper to use cooling emulsions, gentle or strong opiates to moderate the spastic strictures, as occasion shall require. Camphire, mixed with nitre and calx of antimony, will be highly necessary, if the matter of exanthemata or cutaneous eruptions is the cause of the hæmorrhage, as is often the case.

A revulsion may be made from the head by bleeding in the lower parts; then by temperate pediluvia, and putting the hands into warm water.

As there is often an acrid bilious matter lodged in the hypochondria, the parent of wind and spasms, the powder of rhubarb will be proper, mixed with a few grains of tartar vitriolate and nitre; as also emollient and carminative clysters, with a due proportion of oil.

Externally, refrigerants may be mixed with discutients, and applied to the forehead, nose and neck.

But it must be noted, that when the patient is plethoric, the bleeding must not be stopped hastily, if at all; nor when the menses in women have been suppressed, or the lochia, or the bleeding piles in men accustomed thereto; much less must a stoppage be attempted when the bleeding itself is periodical.

In persons of a bilious constitution, cold water alone drank freely, has had a good effect.

BLEND-METAL *Iron*, a coarse sort of iron from Staffordshire mines, used for making nails and heavy ware; in some places also for horseshoes.

BLEYME, in farriery, an inflammation in a horse's hoof, occasioned by blood putrified in the inner part of the coffin towards the heel, between the sole and the coffin-bone.

There are three sorts of bleymes; the first, bred in spoiled wrinkled feet with narrow heels, are usually seated in the inward or weakest quarter; the second, besides the usual symptoms of the first, infects the gristle, and must be extirpated, as in the cure of a quitter bone; the third is occasioned by small stones and gravel between the shoe and the sole. For a cure, they pare the foot, let out the matter, if any, and dress the sore, like the prick of the nail.

BLIGHT. There is nothing more common in the beginning of summer, than to see the leaves of peaches, nectarines, and cherries, curled up and blighted, which leaves on examination are found covered with little insects, some blackish, others green, some winged, and others without wings; these creatures bring forth their young alive and perfect, and if their bodies be opened, several perfect embryoes will be seen therein. It remains a doubt whence, and by what means, these insects are conveyed upon the young sprouting leaves, which at the same time are always covered with a glutinous and honey-like moisture; but diligent observations are likely to discover the secret. Trees in this condition are visited by multitudes of ants, which hurt not the trees, (as some have erroneously conjectured) but do them service, by devouring these vermin that infest them.

It is evident that, from the great increase of these insects, fruit and other trees, with most sorts of plants, sustain great damage, and more especially when they co-operate with blights.

Some have supposed, that blights are usually produced by an easterly wind, which brings vast quantities of insects eggs along with it from some distant place; which, being lodged upon the surface of the leaves and flowers of fruit-trees, cause them to shrivel up and perish. To cure this distemper, they advise the burning of wet litter on the windward side of the trees, that the smoke may be carried to them by the wind, which they suppose will stifle and destroy those insects, and thereby cure the distemper. Others direct the use of tobacco-dust, or to wash the trees with water wherein tobacco-stalks have been infused for twelve hours,

or

or to ſcatter pepper-duſt upon the bloſſoms of fruit trees.

But the true cauſes of blights are from a continued dry eaſterly wind, for ſeveral days together, without the intervention of ſhowers, or any morning dew, by which the perſpiration in the tender bloſſoms is ſtopped, ſo that in a ſhort time their colour is changed, and they wither and decay; and if it ſo happen, that there is a long continuance of the ſame weather, it equally affects the tender leaves; for their perſpiring matter is hereby thickened and rendered glutinous, cloſely adhering to the ſurface of the leaves; and becomes proper nutriment to thoſe ſmall inſects, which are always found preying upon the leaves and tender branches of fruit-trees, whenever this blight happens; but it is not theſe inſects which are the firſt cauſe of blights, as hath been imagined by ſome, though it muſt be allowed, that, whenever theſe inſects meet with ſuch a proper food, they multiply exceedingly, and are inſtrumental in promoting the diſtemper; ſo that many times, when the ſeaſon proves favourable to them, and no proper care has been taken to prevent the miſchief, it is ſurpriſing to think how whole walls of trees have ſuffered by this infection.

The beſt remedy, yet known, for this diſtemper, is, gently to waſh and ſprinkle over the trees, from time to time, with common water (that is, ſuch as had not any thing ſteeped in it); and the ſooner this is performed (whenever we apprehend danger) the better, alſo to water well the roots (particularly in dry lands); and if the young and tender ſhoots ſeem to be much infected, waſh them with a woollen cloth, ſo as to clear them, if poſſible, from all this glutinous matter, that their reſpiration and perſpiration may not be obſtructed; and if we place ſome broad flat pans or tubs of water near the trees, that the vapours exhaled from it may be received by the trees, it will keep their tender parts in a ductile ſtate, and greatly help them. This ſhould be done early in the day, that the moiſture may be exhaled before the cold of the night comes on, eſpecially if the nights are froſty; nor ſhould it be done when the ſun ſhines very hot upon the wall, which might ſcorch up the tender bloſſoms.

But there is another ſort of blight, that ſometimes happens in April or May, and is often very deſtructive to gardens, orchards, and open plantations, and againſt which we know of no remedy. This is what is called a fire-blaſt, which, in a few hours, not only deſtroys the fruit and leaves, but, many times, parts of trees, and ſometimes intire trees have been killed by it.

This is ſuppoſed to be effected by volumes of tranſparent flying vapours, which, among the many forms they revolve into, may ſometimes approach ſo near to an hemiſphere, or hemicylinder, either in their upper or lower ſurfaces, as thereby to make the beams of the ſun converge enough to ſcorch the plants or trees they fall upon, in proportion to the greater or leſs convergency of the ſun's rays.

Boerhaave obſerves, that thoſe white clouds, which appear in ſummer-time, are, as it were, ſo many mirrors, and occaſion exceſſive heat: theſe cloudy mirrors are ſometimes round, ſometimes concave, polygonous, &c. When the face of the heavens is covered with ſuch white clouds, the ſun, ſhining among them, muſt produce a vehement heat; ſince many of his rays, which would otherwiſe, perhaps, never touch our earth, are hereby reflected to us: thus, if the ſun be on one ſide, and the clouds on the oppoſite, they will be perfect burning-glaſſes: and hence the phænomenon of thunder.

I have ſometimes, continues he, obſerved a kind of hollow clouds, full of hail and ſnow, during which the heat was extreme; ſince, by ſuch condenſation, they were enabled to reflect much more ſtrongly: after this came a ſharp cold, and then the clouds diſcharged their hail in great quantities, to which ſucceeded a moderate warmth. Frozen concave clouds therefore, by their great reflections, produce a vigorous heat; and the ſame, when reſolved, exceſſive cold.

Whence, as Dr. Hales obſerves, we ſee, that blaſts may be occaſioned by the reflexions of the clouds, as well as by the above-mentioned refraction of denſe tranſparent vapours.

There is no other remedy againſt this evil, but to make choice of clear healthy ſituations, that the air may paſs freely between the trees, to diſſipate thoſe vapours before they are formed into ſuch volumes. For blights more frequently happen in cloſe plantations, (where the ſtagnating vapours from the earth, and the plentiful perſpirations from the trees, are pent in for want of a free air to diſſipate and diſpel them, which are often obſerved in ſtill weather, to aſcend in ſo plentiful a manner, as to be ſeen by the naked eye, but eſpecially with reflecting teleſcopes, ſo as to make a clear and diſtinct object become dim and tremulous) than in thoſe that are planted at a greater diſtance, or are not ſurrounded with hills or woods; this directs us in the firſt planting of orchards, &c. that we ſhould allow a greater diſtance between the trees, that the air may more freely paſs, alſo the fruits which are produced in this clearer air, will be much better taſted, than thoſe that are ſurrounded with a thick rancid air; for as fruits are often in a reſpiring ſtate, ſo they conſequently, by imbibing a part of theſe vapours, are rendered crude and ill-taſted, which is often the caſe with great part of our fruits in England.

BLIND, deprived of the ſenſe of ſight. See the article BLINDNESS.

BLIND is alſo uſed in ſpeaking of veſſels which are not perforated.

Thus the chemiſts ſay, a blind alembic; that is, one which has no aperture. A tube is ſaid to be a blind one, when it is cloſed at top.

Pore-BLIND, or *Pur*-BLIND, is ſaid of a perſon who is very ſhort-ſighted.

Moon-BLIND, denotes horſes that loſe their ſight at certain times of the moon; to cure which, take half an ounce of lapis calaminaris; heat it red-hot, and quench it in a quarter of a pint of plantain-water, or white-wine: to this add half a dram of aloes, and a ſpoonful of camphor, in powder; and letting them diſſolve, drop part of it into the horſe's eye.

BLIND, among traders, a kind of falſe light which they have in their warehouſes and ſhops, to prevent too great a light from diminiſhing the luſtre of their linens and ſtuffs.

BLIND, or BLINDE, among mineraliſts, a kind of lead marcaſite; by our miners called mock-ore, mock-lead, and wild-lead.

It is a mineral maſs, flaky, gloſſy, and breaking in angles, much like the potters lead-ore, only of a colour more duſky, and approaching to black. In it are veins of a yellow ſhining marcaſite, with a little white ſpar, and on one ſide a greeniſh æruginous matter. On a trial by the fire, it yielded a very little copper, leſs lead, and no tin. It is very obſtinate, ſeveral attempts having been made with the alkaline fluxes to run it, in vain.

BLINDNESS, a total privation of ſight, ariſing from an obſtruction of the functions of the organs of ſight, or from an entire deprivation of them.

The cauſes of blindneſs are various, proceeding from cataracts, gutta ſerenas, &c. There are alſo periodical blindneſs, as a defect of ſight in ſome towards night, in others only in the day; the former of which is termed nyctalopia, the latter hemeralopia. See the articles NYCTALOPIA, &c.

BLINDNESS, in farriery. See the article EYE.

BLINDS, in military affairs, are a kind of frames, compoſed of four pieces of wood, two of which are five or ſix feet in length; the longeſt are pointed at both ends, and the two others are faſtened towards the extremities of the former, at about fifteen inches from their points, the whole forming a rectangular parallelogram, the long ſides of which project or jut out beyond the other about fifteen inches.

The blinds are ſupported againſt the banks of the trenches, and are ſo placed as that their longer ſides are in a vertical poſition. Their points at the bottom ſerve to fix them in the earth, and thoſe at the top to hold the faſcines that are placed upon them; they are placed along both ſides of the banks of the trenches, and others are alſo laid horizontally on the top of them; the latter being alſo covered with faſcines, ſo as that the trench is formed into a kind of covered gallery. This diſpoſition is made when the works are far advanced, and in places where the grenadoes of the beſieged too much annoy the ſoldiers in the trenches.

The term blind is alſo uſed to expreſs a kind of hurdle, made of the branches of trees, behind which the ſoldiers may carry on their works without being ſeen by the enemy.

BLITE, *Blitum*, in botany, a genus of monandrious plants; the flower is apetalous, but the empalement, which is tripartite and premanent, becomes an oval compreſſed capſule, containing a ſeed nearly the ſame ſize. The different ſpecies of this plant are natives of foreign countries, one of which grows naturally in Spain and Portugal. It is annual, and hath leaves reſembling ſpinach. The ſtalk riſes about a foot and a half high, the lower part of which is furniſhed with leaves of the ſame form with thoſe at bottom, but ſmaller; the upper part of the ſtalk hath flowers coming out in ſmall heads at every joint, and is terminated by a ſmall cluſter of the ſame. When the flowers are decayed, the little heads ſwell to the ſize of wood-ſtrawberries, and when ripe have the ſame appearance; they are very ſucculent, and full of a purple juice, which ſtains the hands of thoſe who bruiſe them, of a deep purple colour. All the ſorts of blite are raiſed with little care; for if the ſeeds are permitted to ſhed, they will come up in the ſpring, and make a pretty appearance in the ſucceeding ſummer.

Blite, on account of its cooling and emollient qualities, is recommended in dyſenteries and ſpitting of blood.

BLOCKS, in the marine, little wooden machines artfully diſpoſed amongſt the rigging of a ſhip, ſo as to give additional power to the ropes that command the neceſſary mechaniſm aloft; ſuch as extending, contracting, or traverſing the ſails, by hauling in certain cords on the deck.

It would be difficult to deſcribe the figure of a block, as they are of ſuch various ſizes, ſhapes, and powers, ſingle, double, and even ſix and ſeven-fold, ſo denominated from the number of ſheaves they contain. A common ſingle block approaches neareſt to the figure of a long ſpheroid, ſomewhat flatted in the middle, and is hollowed parallel with the flat part, ſo as to receive a little cylindrical wheel, formed of *lignum vitæ*, or other hard wood, called a ſheave, which has ſufficient room to turn in the block; a pin is then fixed in the center of the block, upon which the ſheave turns as upon an axis: blocks are thus prepared before they come abroad; they are afterwards faſtened by ropes made like a ring, and fitted to a notch in their outſide, and ſuſpended amongſt the maſts and ſhrouds; thoſe of five or ſix ſheaves are

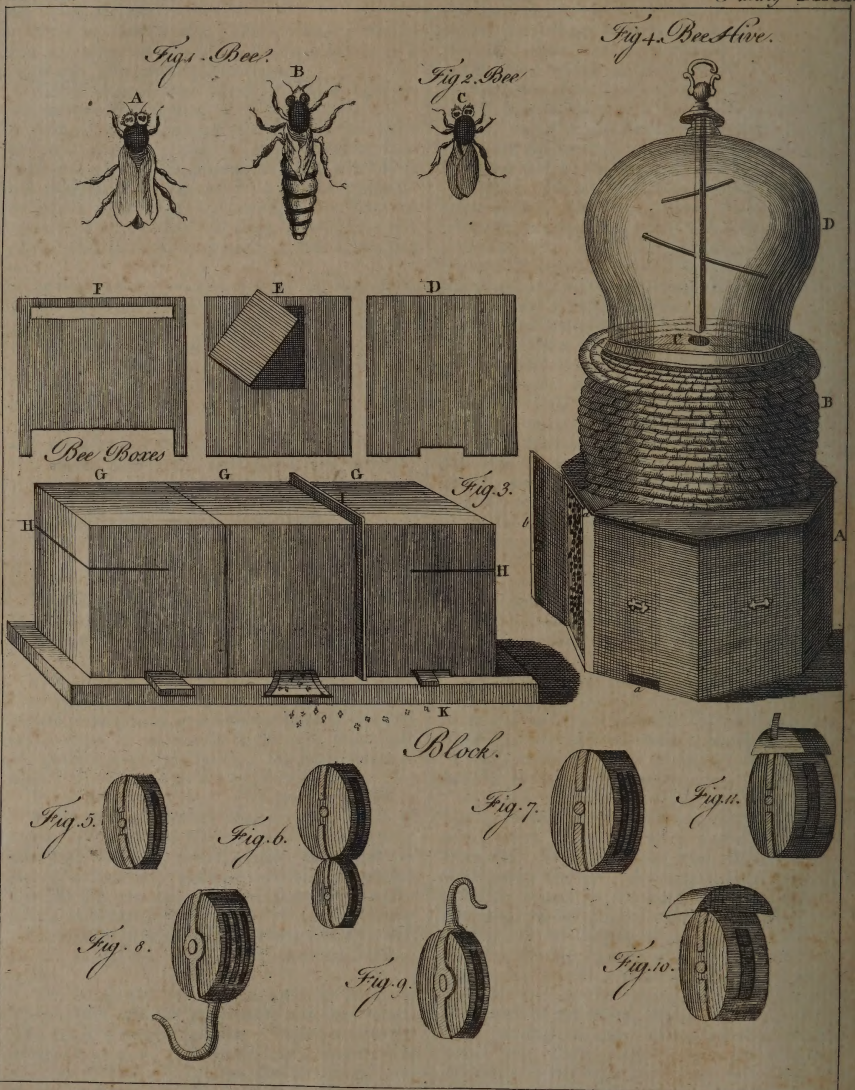


Fig.1. Bee.
A
B
Fig.2. Bee
C
Fig.4. Bee Hive.
D
B
A
F
E
D
Bee Boxes
G
G
G
Fig.3.
H
H
K
Block.
Fig.5.
Fig.6.
Fig.7.
Fig.11.
Fig.8.
Fig.9.
Fig.10.

nearer the form of a cylinder, and are only uſed for lifting weighty bodies, as great maſts, pieces of marble, &c.

Plate XX. *fig.* 5. repreſents a ſingle block; *fig.* 6. and 7. double and treble; 8. a cat-block; 9. a ſwivel iron-bound block; 10. a top-block, and 11. a clue-garnet block.

The cat-block is for drawing the anchor up to the cat-head.

The ſwivel in the iron-bound block is to turn it, that the parts of the purchaſe affixed to it, called the taicle, may not be twiſted round each other, which would greatly diminiſh its force.

The top-block, *fig.* 10. is to hoiſt up or lower the top-maſts, and is hooked in a bolt driven in the cap. See the article CAP.

The clue-garnet blocks, *fig.* 11. are fixed to the clews or lower corners of the ſails, and are for drawing them up to the yard, when the ſail is to be contracted or furled. See CLUE-GARNET.

BLOCKADING, in military affairs, is to ſurround a place with different bodies of troops, who ſhut up all the avenues on every ſide, and permit nothing to go in or out of the place.

The deſign of the blockade is to oblige thoſe who are ſhut up in the town to conſume all their proviſions, and compel them to ſurrender for want of ſubſiſtence.

By this it appears that a blockade muſt laſt a long time, when the place is well provided with neceſſaries; for which reaſon this method of reducing a town is ſeldom taken, but when there is reaſon to believe the magazines are unprovided, or rather when the nature or ſituation of the place permit not the approaches to be made, which are neceſſary to attack it in the uſual way.

Maritime towns which have a port, are in much the ſame caſe as other towns, when their port can be blocked up, and the beſiegers are maſters of the ſea, and can prevent ſuccours from being conveyed that way into the place. If the ſea be open, or if only a few veſſels can find means now and then to enter the port ſecretly and by ſtealth, the place being continually relieved with freſh troops and proviſions, may ſuſtain a very long ſiege. Oſtend, when beſieged by the Spaniards, held out above three years; the ſuccours which it continually received by ſea, furniſhed it with the means of making this long defence.

The ſiege of ſuch places therefore ought never to be undertaken, but when the beſiegers have it in their power to prevent the place from receiving any ſuccour by ſea.

It is not ſufficient to have a numerous fleet before the port, becauſe the enemy may find means to cauſe ſome ſmall barks laden with proviſions to ſlip the fleet in the night. The moſt effectual method of intercepting theſe ſuccours, if the ſituation permits, is to conſtruct a bank, or ſtaccado, as was contrived by cardinal Richlieu, for entirely blocking up the port of Rochelle. There are, indeed, but few ſituations which admit of this expedient; and beſides, the execution of it is ſo difficult, and takes up ſo much time, that it cannot be propoſed as a method to be practiſed in the attack of all maritime towns. All that can be ſubſtituted inſtead of this tedious and laborious work, is a careful and diligent watch aboard the fleet, to prevent as much as poſſible, any bark or veſſel from entering the port of the town. This direction being well obſerved, the attacks on the land are carried on as uſual, the neighbourhood of the ſea cauſing no alteration therein: on the contrary, the ſeveral works of the fortification may be cannonaded from the ſhips, in order to favour the progreſs of the attack.

BLOMARY, or BLOOMARY, in metallurgy, the firſt forge through which iron paſſes, after it is melted out of the ore.

BLOOD, *Sanguis*, a red liquor circulating through the arteries, veins, and other veſſels of animal bodies; and ſerving for the ſupport of life, and nouriſhment of all their parts.

Blood is the great ſource from whence all the other liquors of the body are derived; for the origin of which ſee the article SANGUIFICATION.

Recent blood is equably fluid, and in taſte ſomewhat ſaline. Viewed by a microſcope, it appears compoſed of numerous red globules ſwimming in a tranſparent fluid.

On ſtanding for a little time, it ſeparates into a thick craſſamentum, and fluid ſerum. By agitation, it continues fluid: a conſiſtent polypous matter adheres to the ſtirrer, which, by repeated ablution with water, becomes white.

Received from the vein in warm water, it depoſites a quantity of tranſparent filamentous matter, the red portion continuing diſſolved in the water. On evaporating the fluid, a red powdery ſubſtance is left.

It congeals by froſt, and becomes fluid again by warmth: after the liquefaction it quickly putrefies. Fluid and florid blood, expoſed to a temperate air, putrefies ſooner than in ſuch as is more denſe.

Inſpiſſated to dryneſs, it leaves a dark-coloured maſs, amounting at a medium to about one fourth the weight of the blood, of a dark colour, and a bitter ſaline taſte, eaſily inflammable, burning with a bluiſh flame. The exſiccated blood is not diſſoluble in acid or in alkaline liquors, but gives ſome tincture to water and to ſpirit of wine, and is more powerfully acted upon by dulcified ſpirit of nitre.

Recent blood is coagulated by the mineral acids, and by moſt of the combinations of them with earthy and metallic bodies. With vegetable acids, and with ſolutions of neutral ſalts, it mingles equably without coagulation. Alkalies, both fixed and volatile, render it more fluid, and preſerve it from coagulating.

The ſerum of blood is more ſaline than the craſſamentum, and does not ſo ſpeedily putrefy. It freezes with ſomewhat more difficulty than pure water, and its aqueous part evaporates, by a gentle warmth, ſomewhat more readily, leaving about one twelfth the weight of the ſerum of a ſolid yelloviſh pellucid matter. Expoſed to a heat a little greater than that of the human body, it coagulates into a ſolid maſs, without any conſiderable evaporation. Both this coagulum, and the inſpiſſated ſerum, are readily inflammable in the fire, not diſſoluble in water, or in ſpirit of wine, in acid, or in alkaline liquors.

BLOOD, in medicine, claims the moſt attentive regard of phyſicians. An exceſs of its quantity produces a plethora, lethargy, &c. Fevers are the conſequence of its too rapid motion, and obſtructions, of its viſcidity and languor.

The too great heat and viſcidity of the blood are its prevailing diſorders in a country like this, where people live high, and drink hot inflammable liquors. Beſides temperance, and uſing water as beverage, the milder preparations of mercury contribute greatly to cool and dilute the blood: ſuch are æthiops and cinnabar, if given in moderate doſes, ſo as not to affect the ſtomach, or excite a ſalivation.

Thickneſs of the blood is another diſtemperature, proceeding from a plethora, and diminution of its motion; from whence ariſe obſtructions, ſtagnations, hypochondriac and hyſteric affections, &c. The incubus, or night-mare, is alſo owing to the ſame cauſe.

Spitting of BLOOD is cured by copious bleeding every third day, to the fourth time. Gentle purging is likewiſe recommended; and for appeaſing the commotion of the blood, ſpirit of vitriol, but more eſpecially the tincture of roſes made therewith. A milk diet is alſo preferable to any other; and after the cure is completed, it will be neceſſary, by way of prevention, to bleed once in ſix months for ſeveral years together.

BLOOD, in farriery, a diſtemper in the backs of cattle, which will make a beaſt go as if he drew his head aſide, or after him. In order to cure it, you ſhould ſlit the length of two joints under his tail, and ſo let him bleed well; but if he bleeds too much, knit his tail next the body, and then bind ſalt and nettles bruiſed unto it.

BLOOD *of Chriſt*, the name of a military order inſtituted at Mantua in 1608. The number of knights was reſtricted to twenty, beſides the grand-maſter. Their device was, *Domine probaſti me*, or *Nihil, hoc, triſte, recepta.*

BLOOD *of Chriſt* is alſo the name of a congregation of nuns at Paris.

BLOOD-FLOWER, in botany. See HÆMANTHUS.

BLOOD-SPAVIN. See the article SPAVIN.

BLOOD-STONE. See HÆMATITES.

BLOODY-FLUX. See the articles FLUX and DYSENTERY.

BLOODY-HAND is when a treſpaſſer is apprehended in a foreſt with his hands or other parts bloody; which is a circumſtance of his having killed the deer, though he be not found chaſing or hunting them.

BLOOM, a maſs of iron after having undergone the firſt hammering, called blomary. See the article BLOMARY.

BLOSSOM, or BLOOM, denotes the flowers of plants, and particularly thoſe of fruit-trees.

BLOSSOM, or PEACH-COLOURED, in the manege, a term applied to a horſe that has his hair white, but intermixed all over with ſorrel and bay hairs. Such horſes are ſo inſenſible, and hard both in the mouth and the flanks, that they are ſcarce valued; beſides, they are apt to turn blind.

BLOW-PIPE, among jewellers and other artificers, is a glaſs tube, of a length and thickneſs at diſcretion, wherewith they quicken the flame of their lamp, by blowing through it with their mouth. It is uſed in works of quicker diſpatch, which do not need the bellows.

BLOWING *of a Flower*, among floriſts, ſignifies the care they have taken to produce their flowers in the higheſt perfection, and in particular for auriculas and carnations. The uſual method (reſpecting carnations) is, when the flower ſtems begin to put forth, (or as the floriſts call it to ſpindle) to place by each plant a ſtraight ſtick, four feet long, and tie the ſpindles to it as they ſhoot. When the flower-buds appear, there ſhould be gathered off all the ſmall buds, reſerving only a few of the largeſt to bloſſom; theſe are frequently apt to burſt, whereby the beauty of the flower is conſiderably diminiſhed, to prevent which the pod ſhould be ſlightly tied round the middle. When the bloſſoms begin to expand, they ſhould be ſhaded by a board faſtened to the top of the ſtick, in order to preſerve their beauty the longer; though with ſome bloſſoms, it is neceſſary to place glaſſes over them, in order to draw out the interior petals, ſo as to form the whole flower as nearly hemiſpherical as poſſible.

BLOWING *of Glaſs*, one of the methods of forming the divers kinds of works in the glaſs manufacture.

The workman dips his blowing-pipe into the melting-pot, and by turning it about, the metal ſticks to the iron more firmly than turpentine. This he repeats three times, which is called gathering; he then rolls the end of his inſtrument with the hot metal thereon, on a piece of poliſhed iron, and the workman perceiving there is metal enough on the pipe, claps his mouth immediately to the other end of it, and blows gently through the iron tube, till the metal lengthens like a bladder about a foot.

foot: then he rolls it on a marble ſtone a little while to poliſh it, and blows a ſecond time, by which means he brings it into the form of a globe, of about eighteen or twenty inches in circumference. This globe may be flattened by returning it to the furnace, and brought into any form by ſtamp-irons, which are always ready.

When the glaſs is thus blown, it is cut off at the collet or neck, which is the narrow part that ſtuck to the iron. The method of performing this is as follows: The pipe is reſted on an iron bar, cloſe to the collet; then a drop of cold water being laid on the collet, it will crack about a quarter of an inch, which with a ſlight blow, or cut with the ſhears, will immediately ſeparate the collet.

After this is done, the operator dips the iron-rod into the melting-pot, by which he extracts as much metal as ſerves to attract the glaſs he has made, to which he now fixes this rod at the bottom of his work, oppoſite to the opening made by the breaking of the collet. In this poſition the glaſs is carried to the great bocca, or mouth of the oven, to be heated, by which means it is again put into ſuch a ſoft ſtate, that by the help of an iron inſtrument it can be pierced, opened, and widened, without breaking. But the veſſel is not finiſhed till it is returned to the great bocca, where it being again heated thoroughly, and turned quickly about with a circular motion, it will open to any ſize, by the means of the heat and motion: and by this means we come to learn the cauſe why the edges of all bowls and glaſſes, &c. are thicker than the other parts of the ſame glaſſes; becauſe, in the turning it about in the heat, the edge thickens, and the glaſs being as it were doubled in that part, the circumference appears like a ſelvedge. If there remain any ſuperfluities, they are cut off with the ſhears; for, till the glaſs is cool, it remains in a ſoft flexible ſtate. It is therefore taken from the bocca, and carried to an earthen bench covered with brands, which are coals extinguiſhed, keeping it turning; becauſe that motion prevents its ſettling, and preſerves an evenneſs in the face of the glaſs; where as it cools, it comes to its conſiſtency, being firſt cleared from the iron-rod, by a ſlight ſtroke with the hand of the workman.

If the veſſel conceived in the workman's mind, and whoſe body is already made, requires a foot, or a handle, or any other member, or decoration, he makes it ſeparate, and now eſſays to join them with the help of the hot metal, which he takes out of the pot with his iron-rod: but the glaſs is not brought to its true hardneſs, till it has paſſed the leer or annealing oven.

Blowing *of Crown Glaſs*. The above method is applicable to the working of crown glaſs, till the blowing-iron or pipe has been dipped the third time; for then, inſtead of rounding it, the workman blows, and at the ſame time rolls or kneads the metal upon the iron plate, into the form of a cylinder. This cylinder is put again to the fire, and blown a ſecond time, and is thus repeated, till it is extended to the dimenſions required; the ſide to which the pipe is fixed diminiſhing gradually, till it ends in a conical form. While the glaſs is thus flexible, a ſmall piece of metal is added in the center, oppoſite to the pipe fixed to an iron-rod, and with a drop of cold water and a ſlight blow is knocked off from the pipe.

The cylinder, being now open at one end, is carried back to the flaſhing furnace, where the mouth or aperture of the cylinder is put to warm at the noſe hole, adjoining to the flaſhing furnace, and when at a proper degree of heat is opened on an inſtrument for that purpoſe in a circular form of about four or five inches diameter. This done, it is carried to the flaſhing furnace, where a briſk fire is continually kept, and by turning it quickly about in the fire in a circular motion, immediately opens and forms itſelf into a table glaſs, and by the aſſiſtance of a pair of ſhears, is cut off from the iron rod, which cauſes the knot or knob in the middle: this done, it is carried upon forks, and put into the annealing furnace, where it remains for thirty hours. In this furnace upwards of an hundred tables of glaſs may lie at a time without any injury to each other, by ſeparating them into tens, with an iron ſhiver between, which diminiſhes the weight by dividing it, and keeps the tables flat and even.

This was the method formerly made uſe of for making large plate glaſs, looking-glaſſes, &c. But the workmen by this method could never exceed fifty inches in length, and a proportional breadth; becauſe what were larger were always found to warp, which prevented them from regularly reflecting the objects, and wanted ſubſtance to bear the neceſſary grinding. Theſe imperfections have been removed by an invention of the Sieur Abraham Thevart, a Frenchman, about the year 1688, of caſting or running large plates of glaſs. See *Caſting of* Glass.

For the manner of founding glaſs, and the materials of which it is compoſed; ſee the article Glass.

Blowing *of Tin* denotes the melting its ore, after being firſt burned to deſtroy the mundic.

BLUBBER denotes the fat of whales, and other large ſea animals, whereof is made train oil. See the article Oil.

BLUE, otherwiſe called Azure, is one of the primitive colours of the rays of light.

In oil and miniature, they alſo uſe indigo prepared; as alſo a fictitious ultramarine. See the articles Ultramarine and Indigo.

Turnſole Blue is uſed in painting on wood, and is made of the ſeed of that plant. The way of preparing it is, to boil four ounces of turnſole in a

pint and a half of water, in which lime has been ſlacked.

Dyers BLUE is one of their ſimple or mother colours, uſed in the compoſition of others. It is made of woad, indigo, and a paſtel brought from Normandy. Some dyers heighten their blue by adding brazil and other woods. See WOAD and INDIGO.

A BLUE *for painting or ſtaining of Glaſs.* Take fine white ſand twelve ounces, zaffer, and minium, of each three ounces; reduce them to a fine powder in a bell-metal mortar; then putting the powder into a very ſtrong crucible, cover it and lute it well, and being dry, calcine it over a quick fire for an hour: take out the matter and pound it; then to ſixteen ounces of this powder, add fourteen of nitre powder; mix them well together, and put them into the crucible again; cover and lute it, and calcine for two hours on a very ſtrong fire.

Pruſſian BLUE. This blue is next to ultramarine for beauty, if it be uſed in oil. This colour does not grind well in water. See PRUSSIAN-*Blue.*

BLUE *Bice* is a colour of good brightneſs, next to Pruſſian blue, and alſo a colour of a body, and will ſlow pretty well in the pencil.

Saunders BLUE is alſo of very good uſe, and may ſerve as a ſhade to ultramarine or the blue bice, where the ſhades are not required to be very deep, and is of itſelf a pleaſant blue, to be laid between the light and ſhades of ſuch a flower as is of a mazarine blue.

Lacmus, or *Litmus* BLUE. This is a beautiful blue, and will run in a pen as free as ink. It is made of lacmus, and prepared thus: Take an ounce of lacmus, and boil it in a pint of ſmall beer wort, till the colour is as ſtrong as you would have it; then pour it off the liquor into a gallipot, and let it cool for uſe. This affords a beautiful colour, has extraordinary effects, and is a holding colour; if it be touched with aqua-fortis, it immediately changes to a fine crimſon, little inferior to carmine.

BLUE *Japan.* Take gum-water, what quantity you pleaſe, and white lead a ſufficient quantity, grind them well upon porphyry; then take iſinglaſs ſize, what quantity you pleaſe, of the fineſt and beſt ſmalt a ſufficient quantity, mix them well; to which add of your white lead, before ground, ſo much as may give it a ſufficient body; mix all theſe together to the conſiſtence of a paint.

BLUEING *of Metals* is performed by heating them in the fire, till they aſſume a blue colour; particularly practiſed by the gilders, who blue their metals before they apply the gold and ſilver leaf.

BLUE-BOTTLE, in botany. See CENTAUREA.

BLUE-MANTLE in heraldry, the title of a purſuivant at arms.

BLUENESS, the quality which denominates a body blue; or it is ſuch a ſize and texture of the parts which compoſe the ſurface of a body, as diſpoſe them to reflect the blue, or azure rays of light, and thoſe only to the eye.

BLUNDERBUSS, a ſhort fire-arm with a wide bore, capable of holding a number of bullets at once.

BLUSHING, a ſuffuſion, or redneſs of the cheeks, excited by a ſenſe of ſhame, on account of a conſciouſneſs of ſome failing or imperfection.

BMI, in muſic, the third note in the modern ſcale. See the article SCALE.

BOARD, a long piece of timber, ſawed thin for building and ſeveral other purpoſes. See the article TIMBER.

BOARD is alſo uſed for an office under the government. Thus we ſay, the board of trade and plantations, the board of works, ordnance, &c.

BOARDING, in a naval engagement, a deſperate and furious aſſault made by one ſhip on another to defeat her, by entering aboard her in battle, either becauſe the common methods of cannonading and firing muſquetry had failed of ſucceſs, or becauſe ſhe may have a greater number of men, and be better equipped for this attack than the enemy who defends herſelf againſt it.

An officer ſhould conſider well the dangerous conſequences that attend boarding a ſhip of war, before he attempts it; and be pretty certain that his adverſary is thin of men; for, perhaps, he wiſhes to be boarded; if ſo, great ſlaughter muſt enſue.

Before boarding, the officer ſhould alſo judge of his own ſtrength as well as that of the enemy; the ſea muſt likewiſe be conſidered, leſt it may run ſo high as to endanger both ſhips going to the bottom. Ships of equal force ought not to be fond of this mode of fighting, and when they do attempt it, it may be more adviſeable to lay the enemy's ſhip aboard on the lee-ſide, eſpecially if there be any ſwell or ſea, as the water is there the ſmootheſt: beſides, in laying a ſhip aboard to leeward, if you find too warm a reception, you can better get clear and ſtand off from the enemy; this appears, however, to be the only advantage of being to leeward; but as the weather-ſhip can, at moſt times, be to leeward when ſhe pleaſes, it is, perhaps, more eligible to be to windward, ſince ſhe will have it in her power, as ſhe paſſes under the lee of her antagoniſt, to rake her in croſſing athwart the ſtern, (i. e. firing her broadſide in at the other's ſtern, ſo that the ſhot will rake the whole length of the ſhip, which is probably the moſt fatal event that can happen in a ſea-engagement.) This if ſhe can once effectually perform, ſhe muſt in all likelihood conquer her adverſary, and the ſame, if ſhe can lay him athwart hawſe, which

which both will endeavour to avoid, if either ſees the other attempt it. See ATHWART.

Boarding may be performed in different places of the ſhip according to the circumſtances, preparation, and poſition of both; the aſſailant having previouſly ſelected a number of men armed with piſtols and cutlaſſes, and occaſionally provided with powder-flaſks; theſe are ſlight bottles filled with gun-powder, and fitted with a fuſe, which is lighted immediately before the aſſault: when the ſhips are laid cloſe to each other, the powder-flaſks are thrown amongſt the crew of the ſhip intended to be boarded; theſe inſtantly break, are fired by the fuſes, and cover the deck with horror, ſmoke, and confuſion; add to this, that they who put this attempt in execution have generally an earthen ſhell ſuſpended from their yard-arms, or bowſprit-end, called a ſtink-pot; this machine is likewiſe charged with powder, together with certain ſuffocating and inflammable materials, with a lighted fuſe at the aperture: this alſo is let fall at the ſame time with the powder-flaſks upon the deck of the defendant, and at once burſts, catches fire, and fills the deck with intolerable ſtench and diſtraction: amidſt the confuſion produced by this infernal apparatus, the detachment provided ruſh aboard, ſword in hand, under cover of the ſmoke on their antagoniſt, who ſtands in the ſame ſituation with a citadel ſtormed by the beſiegers, and is eaſily overpowered unleſs he has cloſe-quarters, to where he can retreat. See BOWSPRIT, CLOSE QUARTERS. This ſtratagem is rarely however put in execution by his majeſty's ſhips, which moſt commonly decide the battle by cannonading, and ſeldom grapple with their enemies: it is chiefly practiſed by privateers on the ſtouteſt merchant-ſhips, &c.

"To prevent boarding, if the ſhip is boarded on the quarter, the detachment of marine forces ſhould keep in cloſe order, fire a volley on the enemy as they attempt to board, charge them at once with bayonets, and never give them time to get any footing.

"If the ſhip is boarded on the bow, or in the waiſt, (i. e. fore-part or middle) and it ſhould be thought neceſſary to order ſome marines thither from the poop or quarter-deck, the front rank muſt face at once to the right, or left, run to the place directed, and charge the enemy in an inſtant; if the rear rank is wanted, the ſame directions are to be obſerved.

"When marines have been long enough at ſea to get the proper uſe of their hands and legs, I can ſee no reaſon why they ſhould not be employed in boarding the enemy, as well as the ſeamen, when ſuch ſervice is intended. I would therefore propoſe, that a marine officer ſhould take the choice of the detachment, arm them with piſtols and cutlaſſes, and board with them in conjunction with a ſea-officer and the party of ſailors: the marines, who enter voluntarily on this ſervice, ſhould have ſome reward, be particularly reſpected, and recommended to be made corporals as ſoon as poſſible." The three laſt paragraphs we have quoted from *Mr. Macintire's Treatiſe on the Diſcipline of Marine Forces*; to which we may ſubjoin, that,

To prevent boarding, a high rope-netting extended by the ſhrouds from one end of the ſhip to the other, has been frequently uſed; and we may add, as our own opinion, that if ſome ſmall taicles were ready to be hooked to the bottom of this netting, which is to hang looſe over the ſhip's ſide, being then more difficult to ſurmount, as it ſwings in and out by the ſhip's rolling, theſe taicles being hooked on the outſide inſtantly on the attempt to board, which might eaſily be done, and then the lower part of the netting hoiſted up, while the boarders are climbing on it, would exhibit a very extraordinary and ſomewhat ridiculous ſpectacle, by entangling and ſuſpending a ſwarm of the boarders, as a mark for the muſquetry of the marines at their leiſure.

BOAT is a ſmall open veſſel, conducted on the water by rowing or ſailing. The conſtruction, machinery, and even the names of boats are very different, according to the various purpoſes for which they are calculated, and the places where they are to be employed.

Thus they are occaſionally ſharp, or flat bottomed; ſlight, or ſtrong; open, or decked; plain, or ornamented, as they may be deſigned for deep or ſhallower bottoms; for ſwiftneſs or burthen; for ſailing in a harbour or at ſea; and for convenience or pleaſure.

The largeſt boat uſed by a ſhip of war is the long-boat, which is commonly furniſhed with a maſt and ſails, and can be occaſionally decked, armed, and equipped, for cruiſing ſhort diſtances againſt the enemy, or ſmugglers, or impreſſing ſeamen, &c.

The barges are next in order, which are long, ſlighter, and narrower, and are employed to row admirals, and captains of men of war; theſe are very unfit for ſea. See the article BARGE, in the ſecond paragraph.

Pinnaces exactly reſemble barges, only that they are ſomewhat ſmaller, and never row more than eight oars, whereas a barge properly never rows leſs than ten: theſe are for the uſe of the lieutenants, &c.

Cutters of a ſhip are broader, deeper, and ſhorter than the barge and pinnaces; they are fitter for ſailing, and are commonly employed for carrying ſtores, paſſengers, &c. to and from the ſhip to which they belong. In the ſtructure of theſe ſort of cutters, the lower edge of every plank in the ſide overlays the next below it.

Yawls are ſomething leſs than the cutters, nearly of the ſame form, and uſed for ſimilar ſervices.

The above particularly belong to men of war:

mer-

merchant-ſhips have ſeldom more than two, or three at moſt, viz. long-boat and yawl; they may occaſionally have a ſmall pinnace or ſkiff beſides.

Merchant-ſhips which uſe the Mediterranean navigation, commonly have, and always ought to have a lanch in the place of a long-boat; which is longer, more flat-bottomed, and better calculated every way for the harbours of that ſea than a long-boat.

Wherries are light, ſharp, boats, uſed in a river or harbour for carrying paſſengers to and fro.

Punts are a ſort of oblong, flat-bottomed boats, nearly reſembling floating ſtages; they are uſed by ſhipwrights and caulkers for breaming, caulking, or repairing a ſhip's bottom.

A Moſes is a very flat broad boat, uſed by merchant-ſhips amongſt the Caribbee-Iſlands, to bring off hogſheads of ſugar from the ſea-beech.

A felucca is a light boat ſomewhat reſembling a wherry, employed in the Mediterranean for paſſage: the natives of Barbary alſo call a ſmall cruiſing galley felucca.

For the larger ſorts of boats, ſee the articles CRAFT, CUTTER, SHALLOP, PERIAGUA.

Of all the ſmall boats, a Norway yawl ſeems to be the beſt calculated for ſea, as they will often appear out on the coaſt of that country, when a ſtout ſhip can hardly carry any ſail.

BOATSWAIN of a ſhip, the officer who has the boats, ſails, rigging, colours, anchors, and cables committed to his charge.

It is likewiſe his office to ſummon the crew to their duty, and aſſiſt, with his mates, in relieving the watch, to ſee that the men attend the neceſſary buſineſs of the ſhip upon deck, and perform it with as little noiſe as poſſible.

The boatſwain, partly from a perpetual bellowing, and partly from a bear-like ſympathy, and ſavage affectation to imitate his brethren of the ratan, acquires a tone of voice ſo very harſh and terrible, that in the opinion of a celebrated Mileſian muſical doctor, this inharmonious ſtrain very nearly reſembles the braying of an aſs. Indeed, it is ſo difficult to diſtinguiſh their voices from one another at a diſtance, that while two officers of different ſhips were lately divided in their opinions about a boatſwain whom they heard not far off, each aſſerting him to belong to his own ſhip; the man actually proved to be a different perſon, being only a deputy, or ſubaltern-boatſwain, who had anticipated his rank, and was already perfectly qualified in the modifying his voice to that dreadful ſound.

The boatſwain is moreover appointed to execute the ſame offices at ſea which the hangman does on ſhore; ſuch as ſcourging, or otherwiſe puniſhing offenders.

BOB, a term uſed for the ball of a ſhort pendulum.

BOBBIN, a ſmall piece of wood turned in the form of a cylinder, with a little border jutting out at each end, bored through to receive a ſmall iron pivot. It ſerves to ſpin with the ſpinning-wheel, or to wind thread, worſted, hair, cotton, ſilk, gold, and ſilver.

There are bobbins of ſeveral lengths and ſizes, according to the materials which are to be ſpun or wound. Thoſe uſed by the ſilk dealer and the manufacturers in gold and ſilver, are thick ſhort bobbins; and ſo are thoſe uſed by the woollen manufacturers.

BOB-STAY, in the marine, a rope inſerted through a ſhip's prow, or ſtem, and having both parts of it reach up, after the inſertion, to the middle of the bowſprit, where the ends are ſpliced together, till it becomes like one of the links of a chain: after this, it is drawn extremely tight by the application of mechanical powers.

The uſe of the bob-ſtay is to draw down and keep ſteddy the bow-ſprit, and counteract the ſtrain of the ſtays, which draw it upwards: the bow-ſprit is alſo fortified by ſhrouds on each ſide, which are all very neceſſary, as the foremaſt and the upper-part of the main-maſt are ſtayed, and greatly ſupported by the bowſprit. See BOWSPRIT, MAST, STAY. For this reaſon, the bob-ſtay is the firſt ſtay ſet up, that is, drawn tight, in a ſhip; to perform which taſk more effectually, it is common to ſuſpend a boat, or ſome other weighty body, at the bowſprit end to preſs it downwards.

BOCARDO, among the logicians, the fifth mode of the third figure of ſyllogiſms, in which the middle propoſition is an univerſal affirmative, and the firſt and laſt particular negatives; thus:

BO Some fickly perſons are not ſtudents;
CAR Every fickly perſon is pale;
DO. Therefore ſome perſons are pale that are not ſtudents.

BOCCONIA, in botany, a dodecandrious plant, whoſe flower conſiſts of four narrow petals with ten ſhort filaments; the fruit is oval, contracted on each ſide, long and compreſſed, containing a cell filled with pulp, including a ſingle round ſeed. This plant is common in Jamaica and ſeveral other parts of America, where it grows to the height of ten or twelve feet, having a ſtraight trunk as large as a man's arm, covered with a white ſmooth bark. At the top it divides into ſeveral branches, on which the leaves are placed alternately; theſe leaves are eight or nine inches long, and five or ſix broad, deeply ſinuated, ſometimes almoſt to the midrib, and are of a fine glaucous colour. The whole plant abounds with a yellow juice like the greater celandine, which is of an acrid nature, ſo that it is uſed by the inhabitants of America to take off warts and ſpots from the eyes. It is propagated by ſeeds, but being very ten-

tender, must be kept constantly in a hot-house to preserve in this climate.

BOCK-LAND, in the Saxons time, is what we now call freehold lands, held by the better sort of persons by charter or deed in writing, by which name it was distinguished from folkland, or copy-hold land, holden by the common people without writing.

BODY, in philosophy, a solid, extended, palpable substance; of itself merely passive, and indifferent either to motion or rest, but capable of any sort of motion, and of all figures and forms. Body is composed, according to the Peripatetics, of matter, form, and privation; according to the Epicureans and Corpuscularians, of an assemblage of hooked heavy atoms; according to the Cartesians, of a certain quantity of extension; according to the Newtonians, of a system or association of solid, massy, hard, impenetrable, immoveable particles, ranged or disposed in this or that manner; whence result bodies of this or that form, distinguished by this or that name.

That all bodies agree in one common matter, the schoolmen themselves allow; making what they call the materia prima to be the basis of them all; and their specific differences to spring from their particular forms: and since the true notion of body consists either alone in its extension, or in that and impenetrability together, it will follow, that the differences, which make the varieties of bodies we see, must not proceed from the nature of mere matter, of which we have but one uniform conception; but from certain attributes, such as motion, size, position, &c. which we call mechanical affections.

"We are as far, says Mr. Locke, from the "idea of substance of body, by the complex idea "of extended, figured, coloured, and all other "sensible qualities, which is all we know of it, "as if we knew nothing at all; nor after all the "acquaintance and familiarity, which we imagine "we have with matter, and the many qualities "men assure themselves they perceive and know "in bodies, will it, perhaps, upon examination, "be found, that they have any more or clearer "primary ideas belonging to body, than they have "belonging to immaterial spirit. The primary "ideas we have peculiar to body, as contradistin-"guished to spirit, are, the cohesion of solid, and "consequently separable parts; and a power of "communicating motion by impulse. These are "the original ideas proper and peculiar to body; "for figure is but the consequence of finite exten-"sion." After which he goes on, and clearly proves the idea of the substance of spirit and body, equally clear and known to us.

BODY, among painters, as to bear a body, a term signifying that the colours are of such a nature, as to be capable of being ground so fine, and mixing with the oil so entirely, as to seem only a very thick oil of the same colour.

But such colours as are said not to bear a body, will readily part with the oil when laid on the work; so that when the colour shall be laid on a piece of work, there will be a separation; the colour in some parts, and the oil in others, except they are tempered extraordinary thick.

BODY, in the art of war, a number of forces, horse and foot, united and marching under one commander.

Main BODY *of an Army*, the troops encamped in the center between the two wings, and generally infantry; the other two bodies are the vanguard and the rear-guard: these being the three into which an army, ranged in form of battle, is divided.

BODY *of Reserve*. See RESERVE.

BODY, *in Geometry*, is that which has three dimensions; length, breadth, and thickness; and is generated by the motion of a superficies. See SOLID.

BOERHAVIA, in botany, a genus of monandrious plants, whose flower consists of a single campanulated petal, erect, and of a quintangular form; it hath in some species one, and in others two filaments, which are short, and topped with double globose antheræ; the germen is placed below the receptacle, supporting a short filiform stile, and becomes afterward a single oblong seed. The inhabitants of the West-Indies, where these plants are natives, give them the name of hog-weed, and ascribe to them many excellent virtues. In this climate they are raised from seeds, and require a hot-house to preserve them.

BOG properly signifies a quagmire, covered indeed with grass, but not solid enough to support the weight of the body; in which sense it differs only from marshes or fens, as a part from the whole; some even restrain the term bog to quagmires pent up between two hills; whereas fens lie in champaign and low countries, where the descent is very small.

To drain boggy lands, a good method is, to make trenches of a sufficient depth to carry off the moisture; and if these are partly filled up with rough stones, and then covered with thorn-bushes and straw to keep the earth from filling up the interstices, a stratum of good earth and turf may be laid over all; the cavities among the stones will give passage to the water, and the turf will grow at top, as if nothing had been done. See the article FEN.

BOGOMILI, or BOGARMITÆ, in church history, a sect of heretics, which sprung up about the year 1179. They thought that but seven books of the Scripture are to be received; that the use of churches, of the sacrament of the Lord's supper, and all prayer, except the Lord's prayer, ought to be abolished; that the baptism of Catholics is im-

imperfect; that the persons of the Trinity are unequal; and that they oftentimes made themselves visible to those of their sect. They said, that the devils dwelt in the churches; and that Satan had resided in the temple of Solomon from the destruction of Jerusalem to their own time.

BOIGUACU, the largest of all serpents, being from twenty-four to forty feet long, and thick in proportion. It is found in the East and West-Indies, where the Europeans, as well as the natives, are extremely fond of it as food.

BOILING, or EBULLITION, in physics, the agitation of a fluid body, arising from the application of fire, &c. The phænomena of boiling may be thus accounted for: the minute particles of the fuel, being detached from each other, and impelled *in orbem* with a great velocity; that is, being converted into fire, pass the pores of the containing vessel, and mix with the fluid. By the resistance they here meet, their motion is destroyed; that is, they communicate it wholly to the quiescent water: hence arises, at first, a small intestine motion in the water, and from the continued action of the first cause, the effect is increased, and the motion of the water continually accelerated; so that, by degrees, it becomes sensibly agitated: but now the particles of fire, sticking on those in the lowest surface of the water, will not only give them an impulse upwards, contrary to the laws of equilibrium, but will likewise render them specifically lighter than before, so as to determine them to ascend according to the laws of equilibrium; and this, either by inflating them into little vesicles, by the attraction of the particles of water around them, or by breaking and separating the little spherules of water, and so increasing the ratio of their surface to their solid content. There will be, therefore, a constant flux of water, from the bottom to the top of the vessel, and consequently a reciprocal flux from the top to the bottom; that is, the upper and under water will change places: and hence we have the reason of that phænomena of the water being hot at top, sooner than at bottom.

Again, an intense heat will diminish the specific gravity of water, so as not only to make it mount in water, but also in air: whence arise the phænomena of vapour and smoke, though the air, inclosed in the interstices of the water, must be allowed a good share in this appearance; for that air, being dilated, and its spring strengthened by the action of the fire, breaks its prison, and ascends through the water into the air, carrying with it of the contiguous spherules of water, so many as shall hang in its villi, or as can adhere immediately to it.

The particles of the air, in the several interstices of the fluid mass thus expanded and moving upwards, will meet and coalesce in their passage; by which means great quantities of the water will be heaved up and let down alternately, as the air rises up, and again passes from the water; for the air, after coalition, though it may buoy up a great heap of water, by its elasticity, while in the water, yet cannot carry it up with itself into the atmosphere; since, when once got free from the upper surface of the water in the vessel, it will unbend itself in the atmosphere, and so its spring and force become just equal to that of the common unheated air: and hence we see the reason of the principal phænomena of boiling, viz. the fluctuating of the surface of the water.

The ingenious Mr. Amenton has shewn, that water heated to a degree of boiling, will not conceive any further heat, how much soever the fire be increased: yet this excellent discovery may receive a considerable improvement from what Mr. Fahrenheit has observed, viz. that the heat of the same boiling water is always regularly greater, by how much the weight of the atmosphere is greater which presses upon its surface: and again, that the same heat of the boiling water diminishes, as the weight of the incumbent atmosphere grows less. Hence, in marking the degree of heat in boiling water, it will be necessary to note the weight of the atmosphere at the same time by the barometer; otherwise no certain measure will be expressed. In the mean time, however, it must be allowed, that so long as the pressure of the atmosphere continues the same, boiling water will not grow hotter by any increase of fire whatever; and with this limitation, Mr. Amenton's rule will for ever hold true. When the difference of the weight of the atmosphere is three ounces, the greatest degree of heat in boiling water, under these different weights, will be eight or nine degrees: from whence the author evidently deduces, that by how much the particles of water are more compressed to each other, upon increasing the incumbent weight, by so much the more fire is required to make them recede from each other, wherein ebullition consists. Hence also he concluded, that a thermometer applied in boiling water, would mark, by the degree of heat it expresses, the gravity of the atmosphere at that time.

BOLES, a genus of earths, moderately coherent, ponderous, soft, and not stiff and viscid; composed of fine particles, smooth to the touch, easily breaking between the fingers, readily diffusible in water, and freely and easily subsiding from it.

BOLE *Armenic* is of a pale colour, between red and yellow, smooth and slippery to the touch, somewhat glossy, pure from sand or any perceptible gritty matter. It readily crumbles betwixt the fingers, and adheres to the tongue. Softened with water,

water, it forms a ſmooth paſte: diluted with a larger quantity of water, it remains for a conſiderable time ſuſpended.

This earth is employed medicinally as a ſtyptic, both internally and externally; a virtue which ſeems to proceed from its ferrugineous impregnation: to the anti-peſtilential and alexipharmic qualities, for which it has long been celebrated, it has no pretence; and ſeveral experiments have ſufficiently evinced, that the abſorbent ones, which ſome aſcribe to it, have no juſt foundation. It is prepared or purified by waſhing it over with water; the pure bole remaining ſuſpended a conſiderable time, ſo as to be poured off with the liquor, whilſt the ſandy or other groſſer matter remains behind: after the bole has ſettled from the water, it is moderately dried, formed into rolls or cakes, and afterwards further exſiccated for uſe.

Red BOLE. The common ſort of this earth is coarſer than the Armenian, and participates more largely of iron: hence it is never given internally, unleſs to cattle.

White BOLE is brought to us ready waſhed, and formed into large rolls or cylindric globes, not of a chalky whiteneſs, but rather of an aſh-colour. Formerly it came only from Tuſcany, or the Iſland Elva: at preſent it is ſupplied chiefly from Norway, the Iſland Bornholm, or places nearer home. It differs from the two preceding in containing no manifeſt irony matter, and conſequently in wanting their aſtringency. It has been recommended as an abſorbent; but experiments made upon it with acids, ſhew that it little deſerves that character, any more than the other boles. Some have a method of recovering the luſtre of pearls, eſpecially the Scotch ones, by warming them a little over the fire, and rubbing them with powdered white bole.

BOLLITO, a name by which the Italians call a ſea-green colour in artificial cryſtal. To prepare this colour, you muſt have in the furnace a pot filled with forty pound of good cryſtal, firſt carefully ſkimmed, boiled, and purified, without any maganeſe: then you muſt have twelve ounces of the powder of ſmall leaves of copper, thrice calcined, half an ounce of zaffer in powder: mix them together, and put them at four times into the pot, that they may the better mix with the glaſs, ſtirring them well each time of putting in the powder, for fear that it ſhould ſwell too much and run over.

BOLONIAN, in general, ſomething belonging to Bologna. Hence

BOLONIAN *Stone* is a ſulphureous kind of ſtone, about the bigneſs of a walnut, found near Bologna; which, when duly prepared by calcination, makes a ſpecies of phoſphorus. See PHOSPHORUS.

BOLSTERS, in the marine, a ſort of ſmall cuſhions, or bags filled with tarred canvas, laid between the collars of the ſtays, and the edge of ſome piece of wood on which they lie; they are uſed to prevent the ſtays from being chaffed or galled by friction, as the ſhip rocks or pitches at ſea.

BOLSTERS *of a Saddle*, thoſe parts of a great ſaddle which are raiſed upon the bows, both before and behind, to hold the rider's thigh, and keep him in a right poſture.

BOLT, among builders, an iron faſtening fixed to doors and windows. They are generally diſtinguiſhed into three kinds, viz. plate, round, and ſpring bolts.

BOLTS, in gunnery, are of ſeveral ſorts, as 1. Tranſum-bolts, that go between the cheeks of a gun-carriage, to ſtrengthen the tranſums. 2. Priſe-bolts, the large knobs of iron on the cheeks of a carriage, which keep the handſpike from ſliding, when it is poizing up the breech of a piece. 3. Traverſe-bolts, the two ſhort bolts that being put one in each end of a mortar-carriage, ſerve to traverſe her. 4. Bracket-bolts, the bolts that go through the cheeks of a mortar, and by the help of quoins keep her fixed at the given elevation. And 5. Bed-bolts, the four bolts that faſten the brackets of a mortar to the bed.

BOLT *of Canvas*, in commerce, the quantity of twenty-eight ells.

BOLT-ROPE, in the marine, a rope paſſing all round the edges of the ſails, to which they are ſewed, to ſtrengthen the ſails, and prevent them from rending: thoſe parts of it which are on the perpendicular or ſloping ſides, are called the leeches; that part at the bottom, the foot-rope; and if the ſail be ſquare or oblong, the upper part is called the head-rope.

BOLTERS, or BOULTERS, a kind of ſieves for meal, having the bottoms made of woollen, hair, or even wire.

BOLTING, or BOULTING, the act of ſeparating the flour from the bran, by means of a ſieve or bolter.

BOLTING-MILL, a verſatile engine for ſifting with more eaſe and expedition. The cloth round this is called the boulter.

BOLUS, an extemporaneous form of a medicine, ſoft, coherent, a little thicker than honey, the quantity of which is a little morſel or mouthful; for which reaſon it is by ſome called buccella.

BOLZAS, a ſort of ticking which comes from the Eaſt-Indies.

BOMB, in military affairs, a large orbicular ſhell of caſt-iron, having a touch-hole, or aperture, through which a fuſe is inſerted, and a quantity of gun-powder pound in to charge it. The fuſe of the bomb is a little kind of fruſtum of a cone, concave within, made of willow linden, or ſome

other very dry wood, filled with a compoſition of the beſt powder, ſulphur, and ſalt-petre. The bomb being charged, this fuſe is thruſt in the cavity through the touch-hole, and when fired, communicates the fire to the powder with which the bomb is charged; the wood of the fuſe, before it is filled, is called the *ampoulette*.

The fuſes for bombs are charged with great care, that nothing may prevent their communicating the fire to the powder in the center of the bomb, to the ſize of which they are to be exactly proportioned; they are driven and fixed into the bomb, ſo that only about an inch and an half comes out beyond the touch-hole.

Theſe bombs produce two dangerous effects, viz. that of ruining the moſt ſubſtantial buildings by their weight, and of creating great confuſion by their ſplinters; for when the powder they are charged with takes fire, its effort breaks or burſts the bomb, and explodes the ſplinters on every ſide with great violence. *Le Blond. Elem. War.*

Experience ſhows, that fifteen pounds of powder ought to be put into a bomb of twelve inches, which weighs when charged one hundred and forty-five pounds: that a bomb of eight inches requires four pounds, weighing when charged about forty pounds; that one of ſix inches requires three pounds, and weighs when charged a little more than twenty-three pounds: and laſtly, that thirty pounds of powder are required for a bomb of ſeventeen inches ten lines diameter, which weighs, when charged, about five hundred and twenty pounds. *M. Belidor Bombard. Franc.*

But later experiments prove, that the ſame bombs charged with a much leſs quantity of powder, will produce the ſame effect. M. Belidor himſelf has reduced this quantity to two pounds and a half for a bomb of twelve inches, and one pound to a bomb of eight.

It is evident that the deſign of the powder with which a bomb is charged, is to make it burſt; and that if it burſts with a quantity of powder leſs than it is commonly charged with, that quantity is ſufficient, and that all above is abſolutely loſt.

There is one particular, however, to be obſerved, which is, that when bombs are intended to fire the buildings on which they are thrown, the larger the charge, the better they ſucceed; but on all other occaſions, the quantity of powder more than ſufficient to burſt the bomb, cannot produce any advantageous effect. See MORTAR, PROJECTILE.

The fuſes of bombs are charged long before there is any occaſion to uſe them; and that the compoſition they are filled with may not fall out, or ſpoil by growing damp or wet, the two ends are covered with a compoſition of tallow, mixed either with bees-wax or pitch. When the fuſe is to be put into the bomb, care is taken to open the little end, or cut it off; as to the great end, it is never opened till the bomb is in the mortar, and juſt going to be fired. *Le Blond. Elem. War.*

The figure A, (Plate XXI. *fig.* 1.) ſhews a bomb as it appears to the eye; the ſecond, B, repreſents the ſection or profile, and conſequently ſhows its thickneſs; the parts *d* and *c* of the bomb A, are its handles, or the parts by which it is lifted up; *e* is the touch-hole through which the powder is poured to charge it.

It appears by *fig.* B. that the lower part of the bomb is thickeſt, which is contrived that the bomb being heavier on that ſide, may be ſure to fall upon it, and never upon the fuſe *f*, *g*; this heavy under part is called the breech of the bomb. The diameter of a bomb ought, at leaſt, to be five or ſix lines leſs than the bore of the mortar from which it is to be diſcharged.

BOMB-BATTERY. See BATTERY *of Mortars.*

BOMB-CHEST. See the article CAISSON.

BOMB-VESSELS, in the marine, ſmall ſhips particularly calculated for throwing bombs into a fortreſs: they are ſaid to be invented by M. Reyneau, and to have been firſt put in action at the bombardment of Algiers; till then, it had been judged impracticable to bombard a place from the ſea. See the article BOMB-KETCH.

BOMBARD, a piece of ordnance, antiently in uſe, very ſhort and thick, with an extreme large bore. There have been bombards which have thrown a ball of three hundred weight: they made uſe of cranes to load them. There are ſtill ſome of theſe in uſe amongſt the Turks.

BOMBARDIER, the perſon employed in charging the bomb, fixing and driving in the fuſe, and loading and firing the mortar, under the direction of the engineers: he is alſo employed in other military fire-works.

BOMBARDING, the act of aſſaulting a city or fortreſs, by throwing bombs into it, in order to ſet fire to, and ruin the houſes, magazines, &c. and to do other miſchief.

As one of the effects of the bomb reſults from its weight, it is never diſcharged as a ball from a cannon, that is, by pointing or directing it at a certain object; but the mortar is a little inclined from the horizon, ſo that the bomb being thrown up obliquely, much in the ſame direction as a tennis-ball ſtruck by the racket, may fall upon the place intended; from whence it appears, that a mortar has no point-blank range, or at leaſt that no uſe is made of it. See MORTAR, PROJECTILE, RANGE.

If the fuſe ſets fire to the bomb before it falls on the place intended, the bomb will burſt in the air, and may do as much miſchief amongſt thoſe who fired the mortar, as thoſe againſt whom it was diſcharged. To prevent this inconvenience it is ſo contrived, that the fuſe (the time of its burning out being pretty exactly known) ſhall not fire the bomb

bomb, till the moment of its fall on the place againſt which it is thrown. To effect this (as the fuſe will laſt, at leaſt, as long as the bomb is in going its greateſt poſſible range) when a bomb is thrown to a great diſtance, the fuſe and the mortars are fired at the ſame time, and when the bomb has not far to go, part of the fuſe is ſuffered to burn out before the mortar is diſcharged.

BOMBARDO, a muſical inſtrument of the wind kind, much the ſame as the baſſoon, and uſed as a baſs to the hautboy.

BOMBASINE, in commerce, a kind of ſilk-ſtuff manufactured at Milan, and thence ſent into France and other countries.

BOMBAST, in matters of literature, a high ſtyle made up of hard words, with little meaning, and leſs ſenſe.

BOMBAX, in botany, a genus of trees which are natives of the Weſt-Indies; they generally grow with very ſtraight ſtems, and arrive to a great magnitude, being ſome of the talleſt trees in thoſe countries. They ſeldom put out any ſide branches till they arrive to a conſiderable height; the branches towards the top are furniſhed with leaves, compoſed of five, ſeven, or nine oblong ſmooth little leaves, which are ſpear-ſhaped, and join to one center at their baſe, where they adhere to a long foot-ſtalk: theſe fall off every year, ſo that for ſome time the trees are naked, and before the new leaves come out, the flower-buds appear at the end of the branches, and ſoon after the flowers expand, which are compoſed of five oblong purple petals, with a great many ſubulated ſtamina in the center. When theſe decay, they are ſucceeded by large oval fruit, having a thick ligneous cover, which when ripe opens in five parts, and is full of a dark ſhort cotton, incloſing many roundiſh ſeeds. The down which is incloſed in theſe ſeed-veſſels is ſeldom uſed, except by the poorer inhabitants to ſtuff pillows or chairs. The wood is very light, but not much valued, except for making canoes, which is the chief uſe made of it.

BOMBUS, in medicine, a reſounding and ringing noiſe in the ear, which is accounted by Hippocrates a mortal ſymptom in acute diſeaſes.

BOMBYLIUS, in natural hiſtory, the name of the common humble-bee, of which we have a great variety of ſpecies, many of them very beautiful.

BOMBYLOPHAGES, in the hiſtory of inſects, humble-bee-eater, the name of a fly of the tipula kind, which is larger and ſtronger than the common kinds; and loving honey, without knowing how to extract it from the flowers, it ſeizes on the humble-bees, and deſtroys them, in order to get the bag of honey which they contain. It is of a blackiſh colour in the body; its head is of a bright red, and the eyes very large and prominent. It is chiefly found in mountainous places.

BOMONICI, in Grecian antiquity, young men of Lacedæmon, who contended at the ſacrifices of Diana, which of them was able to endure moſt laſhes; being ſcourged before the altar of this goddeſs.

BONA-FIDES, or BONA-FIDE, among lawyers, is as much as to ſay, ſuch a thing was done really, without either fraud or deceit.

BONA-MOBILIA, the ſome with moveable goods or effects.

BONA-NOTABILIA, are ſuch goods as a perſon dying has in another dioceſe than that wherein he dies, amounting to the value of five pounds at leaſt: in which caſe the will of the deceaſed muſt be proved, or adminiſtration granted in the court of the archbiſhop of the province, unleſs by compoſition, or cuſtom, any dioceſes are authoriſed to do it, when rated at a greater ſum.

BONA-PATRIA, an aſſize of countrymen, or good neighbours, where twelve or more are choſen out of the country to paſs upon an aſſize, being ſworn judicially in the preſence of the party.

BONANA, in botany, a genus of plants, otherwiſe called muſa. See MUSA.

BONASUS, in zoology, a ſpecies of wild ox, very thick and bulky, and furniſhed with a mane like a horſe.

BOND, a deed, by which a perſon obliges himſelf to perform certain acts; ſuch as to pay a certain ſum, or to anſwer for another, or to ſerve an apprenticeſhip with a maſter.

In England, a bond is a deed or obligatory inſtrument in writing, whereby a perſon binds himſelf to another, to pay a ſum of money, or to do ſome other act, as to make a releaſe, ſurrender an eſtate, for quiet enjoyment; to ſtand to an award, ſave harmleſs, perform a will, &c. It contains an obligation with a penalty annexed, and a condition which expreſsly mentions what money is to be paid, or what other things are to be performed, and the limited time for the performance thereof, for which the obligation is peremptorily binding.

It may be made upon parchment or paper, though it is uſually on paper, and be either in the firſt or third perſon: and the condition may be either in the ſame deed or in another; and ſometimes indorſed upon the obligation; but it is commonly at the foot of the obligation.

BONE, in anatomy, a hard, brittle, inſenſible part of the body, affording form and ſupport to the whole machine.

BONIS NON AMOVENDIS, in law, is a writ directed to the ſheriffs of London, &c. charging them, that a perſon againſt whom judgment is obtained, and proſecuting a writ of error, be not ſuffered to remove his goods until the error is determined.

BONITO, a beautiful ſea-fiſh of the tunny-kind; it has a long, broad, and thick body, al-

moſt free from ſcales, large eyes and gills, with a broad, gold-coloured ſtreak running along the middle of each ſide from the gills to the tail; it is of a greeniſh colour on the back and ſides; of a ſilvery whiteneſs, and very bright on the belly: there are vaſt ſhoals of theſe fiſh in many parts of the Atlantic-ocean.

BONNET, in the marine, an additional part to be occaſionally laced on, or faſtened to, the bottom of certain ſails in gentle breezes of wind, and taken off again when the ſize of the ſail is to be reduced in freſher gales or ſtorms.

BONNET, in fortification, is a ſmall work raiſed beyond the counterſcarp, having two faces which form a ſaliant angle, and as it were a ſmall ravelin without any trench. The height of this fortification is commonly three feet, and is environed with a double row of paliſadoes, ten or twelve paces from each other. It has likewiſe a parapet three feet high, and is like a little advanced corps de gard.

BONNET A'PRETRE, or *Prieſt's* BONNET, in fortification, is an out-work, having at the head three ſaliant angles, and two inwards; and differs from the double tenaille in this, that its ſides, inſtead of being parallel, are like a ſwallow's tail, that is, narrowing or drawing cloſe at the gorge, and opening at the head.

BONNY, in minerology, a name given by our miners to a bed of ore found in many places in hills, not forming a vein, nor communicating with any other vein, nor terminating in ſtrings, as the true veins do. It is a bed of ore of five or ſix fathom deep, and two, or ſomewhat leſs than that, in thickneſs, in the largeſt ſort; but there are ſmaller, to thoſe of a foot long. They have their trains of ſhoad-ſtones from them, and often deceive the miners with the expectation of a rich lead vein. They differ from the ſquats only in being round beds of ore, whereas the ſquats are flat. See SQUAT.

BONZES, Indian prieſts, who, in order to diſtinguiſh themſelves from the laity, wear a chaplet round their necks, conſiſting of an hundred beads, and carry a ſtaff, at the end of which is a wooden bird; they live upon the alms of the people, and yet are very charitably diſpoſed, maintaining ſeveral orphans and widows out of their own collections. The Tonquineſe have a pagod, or temple, in each town, and every pagod has at leaſt two bonzes belonging to it; ſome have thirty or forty. The bonzes of China are the prieſts of the Fohiſts, or ſects of Fohi; and it is one of their eſtabliſhed tenets, that there are rewards allotted for the righteous, and puniſhments for the wicked, in the other world; and that there are various manſions, in which the ſouls of men will reſide, according to their different degrees of merit. The bonzes of Pegu are, generally, gentlemen of the higheſt extraction.

BOOBY, a heavy ſtupid bird, ſomething reſembling a gull, or ſea-mew, common about Hiſpaniola, Jamaica, or Cuba. It is furniſhed with ſo ſmall a portion of the ſagacity which dictates ſelf-preſervation to almoſt all the feathered tribe, that it will ſuffer any body to take it in the evening or night, when it lights on a ſhip in her paſſage; and will neither, on this occaſion, reſiſt, or attempt to eſcape, but make a continual clamour: it generally lives upon fiſh.

BOOK, *Liber*, the compoſition of a man of wit or learning, deſigned to communicate ſomewhat he has invented, experienced, or collected, to the public, and thence to poſterity; being withal of a competent length to make a volume.

In this ſenſe, a book is diſtinguiſhed from a pamphlet, by its greater length; and from a tome, or volume, by its containing the whole writing. According to the ancients, a book differed from an epiſtle, not only in bulk, but in that the latter was folded, and the former rolled up; not but that there are divers ancient books now extant, under the name of epiſtles.

Origin of BOOKS.—We have nothing that is clear on that ſubject. The books of Moſes are doubtleſs the oldeſt books now extant; but there were books before thoſe of Moſes, ſince he cites ſeveral. Scipio Sgambati, and others, even talk of books before the Deluge, written by the patriarchs Adam, Seth, Enos, Cainan, Enoch, Methuſelah, Lamech, Noah and his wife; alſo by Ham, Japhet and his wife; beſides others, by dæmons or angels; of all which ſome moderns have found enough to fill an Antediluvian library: but they appear all either the dreams of idle writers, or the impoſtures of fraudulent ones. A book of Enoch is even cited in the Epiſtle of Jude, ver. 10. and 15. from which ſome endeavour to prove the reality of the Antediluvian writings; but the book cited by that apoſtle is generally allowed, both by ancient and modern writers, to be ſpurious.

Of profane books, the oldeſt extant are Homer's poems, which were ſo even in the time of Sixtus Empiricus; though we find mention in Greek writers of ſeveral others prior to Homer, as Hermes, Orpheus, Daphne, Horus, Linus, Muſæus, Palamedes, Zoroaſter, &c. but of the greater part of theſe there is not the leaſt fragment remaining; and of others, the pieces which go under their names are generally held, by the learned, to be ſuppoſititious. F. Hardouin goes farther, charging all the ancient books, both Greek and Latin, except Cicero, Pliny, Virgil's Georgics, Horace's Satires and Epiſtles, Herodotus, and Homer, to be ſpurious, and forged in the XIIIth century, by a club of perſons, under the direction of one Severus Archontius. Among the

the Greeks, it is to be obſerved, the oldeſt books were in verſe, which was prior to proſe. Herodotus's hiſtory is the oldeſt book extant of the proſaic kind.

Materials of BOOKS.—Several ſorts of materials were uſed formerly in making books: plates of lead and copper, the bark of trees, bricks, ſtone, and wood, were the firſt materials employed to engrave ſuch things upon, as men were willing to have tranſmitted to poſterity. Joſephus ſpeaks of two columns, the one of ſtone, the other of brick, on which the children of Seth wrote their inventions and aſtronomical diſcoveries. Porphyry makes mention of ſome pillars, preſerved in Crete, on which the ceremonies practiſed by the Corybantes in their ſacrifices, were recorded. Heſiod's works were originally written upon tables of lead, and depoſited in the temple of the Muſes, in Bœotia. The ten commandments, delivered to Moſes, were written upon ſtone; and Solon's laws upon wooden planks. Tables of wood, box, and ivory, were common among the ancients: when of wood, they were frequently covered with wax, that people might write on them with more eaſe, or blot out what they had written. The leaves of the palm-tree were afterwards uſed inſtead of wooden planks, and the fineſt and thinneſt part of the bark of ſuch trees, as the lime, the aſh, the maple, and the elm; from hence comes the word *liber*, which ſignifies the inner bark of trees; and as theſe barks were rolled up, in order to be removed with greater eaſe, theſe rolls were called *volumen*, a volume; a name afterwards given to the like rolls of paper, or parchment.

Thus we find books were firſt written on ſtones, witneſs the Decalogue given to Moſes: then on the parts of plants, as leaves chiefly of the palm-tree; the rind and barks, eſpecially of the tilia, or phillyrea, and the Egyptian papyrus. By degrees wax, then leather, were introduced, eſpecially the ſkins of goats and ſheep, of which at length parchment was prepared: then lead came into uſe; alſo linen, ſilk, horn, and laſtly, paper itſelf.

Form of BOOKS.—The firſt books were in the form of blocks and tables: but as flexible matter came to be wrote upon, they found it more convenient to make their books in the form of rolls: theſe were compoſed of ſeveral ſheets, faſtened to each other, and rolled upon a ſtick, or umbilicus; the whole making a kind of column, or cylinder, which was to be managed by the umbilicus as a handle, it being reputed a crime to take hold of the roll itſelf: the outſide of the volume was called *frons*; the ends of the umbilicus, *cornua*, horns, which were uſually carved, and adorned with ſilver, ivory, or even gold and precious ſtones: the title, συλλαβος, was ſtruck on the outſide; the whole volume when extended, might make a yard and a half wide, and fifty long. The form which obtains among us is the ſquare, compoſed of ſeveral leaves; which was alſo known, though little uſed, by the ancients.

To the form of books belongs alſo the internal œconomy, as the order and arrangement of points and letters into lines and pages, with margins and other appurtenants. This has undergone many varieties; at firſt the letters were only divided into lines, then into ſeparate words, which, by degrees, were noted with accents, and diſtributed, by points and ſtops, into periods, paragraphs, chapters, and other diviſions. In ſome countries, as among the Orientals, the lines began from the right, and ran towards the left; in others, as the northern and weſtern nations, from left to right; others, as the Greeks, followed both directions, alternately going in the one, and returning in the other, called *bouſtrophedon*: in moſt countries the lines run from one ſide to the other: in ſome, particularly the Chineſe, from top to bottom. Again, in ſome the page is entire and uniform; in others, divided into columns; in others, diſtinguiſhed into texts and notes, either marginal, or at the bottom; uſually it is furniſhed with ſignatures and catch-words; ſometimes alſo with a regiſter, to diſcover whether the book is complete. To theſe are added the apparatus of ſummaries, or ſide notes, the embelliſhments of red, gold, or initial letters, head-pieces, tail-pieces, effigies, ſchemes, maps, and the like. The end of the book, now denoted by FINIS, was anciently marked with this character ⊰, called cornis: there alſo occur certain formulas at the beginnings and endings of books; the one to exhort the reader to be courageous, and proceed to the following books; the others were concluſions, often guarded with imprecations againſt ſuch as ſhould falſify them.

BOOK-BINDING is the art of gathering and faſtening together the ſheets of a book, and covering it with a back.

The antient art of binding of books, when firſt the ſeveral ſheets of writings of authors were collected together, was not attended with great difficulties; for the leaves were only glued together, and rolled on round pieces or cylinders of wood; which manner of book-binding, whoſe invention is attributed to the Egyptians, was continued till long after the age of Auguſtus, and is ſtill retained by the Jewiſh ſynagogues, where they continue to write the books of the law on vellums ſewed together, making, as it were, only one long page, with two rollers, having claſps of gold or ſilver at their extremities, the whole book being wrapped up in a piece of ſilk, which ſerves as a cover to it.

But as this manner of binding books is attended with many inconveniencies, one of the Attali, kings of Pergamus, invented the form now in uſe, of ſquare binding, or of ſewing ſeveral quires one over

over another, as more commodious to the reader, who can open and ſhut his book in an inſtant, without the leaſt difficulty, and without the leaves being expoſed to wear out ſo ſoon as when rolled up, eſpecially of books written or printed on paper. It is performed in the following manner:

The leaves are firſt folded with a thin piece of ivory called a folding-ſtick, and laid over each other in the order of the ſignatures; then beaten on a ſtone with a hammer to make them ſmooth and open well, and afterwards preſſed. They are then ſewed upon bands, which are pieces of cord or packthread, ſix bands to a folio-book, five to a quarto, &c. which is done by drawing a thread through the middle of each ſheet, and giving it a turn round each band, beginning with the firſt, and proceeding to the laſt.

The French book-binders apply a ſheet of parchment the length of the book, on the inſide of each paſteboard, ſo, however, as that, being cut or indented in the places againſt the bands, it comes out between the edge of the paſte-board and the leaves of the book, to cover the back; they call this indorſing, and they are obliged to do it, on the penalty of thirty livres, and the re-binding of the book. It is done in the preſs, where the back being grated with an iron inſtrument, with teeth to make the paſte-board hold, wherewith the parchment is firſt faſtened, they afterwards add ſtrong glue to fortify it. After this the books are glued, and the bands opened and ſcraped for the better fixing the paſte-boards; the back is turned with a hammer, and the book fixed in a preſs between two boards, called backing-boards, in order for making a groove for fixing the paſte-boards; which being applied, holes are made for fixing them to the book, which is preſſed a third time: then the book is put at laſt to the cutting-preſs, betwixt two boards, the one lying even with the preſs, for the knife to run upon; the other above it, for the knife to cut againſt; after which the paſte-boards are ſquared with a pair of ſhears.

The next operation is ſprinkling the leaves of the book, which is done by dipping a bruſh made of hog's briſtles into vermilion and ſap-green, holding the bruſh in one hand, and ſpreading the hair with the other; by which motion the edges of the leaves are ſprinkled in a regular manner, without any ſpots being bigger than the others, at leaſt ſo far as to be diſagreeable to the eye.

Then remain the covers, which are either of calf-ſkin, or ſheep-ſkin. Anciently books were always bound in parchment, and moſt of our valuable books, even ſince the invention of printing, have no other binding; but this practice has been long diſuſed. The beſt binding at preſent is in calf.

The calf or ſheep-ſkin, being moiſtened in water, is cut out to the ſize of the book with a knife, then ſmeared over with paſte, made of wheat flour, and afterwards ſtretched over the paſte-board on the out-ſide; and doubled over the edges within-ſide, after having firſt taken off the four angles, and indented and plaited it at the head-band; which done, the book is corded or bound firmly between two bands, with a kind of whipcord, to make the cover ſtick the ſtronger to the paſte-board and the back, as alſo to form the bands or nerves more accurately; then ſet to dry, and, when dry, uncorded, and the leaves at each end opened. Afterwards, the book is waſhed over with a little paſte and water, and then ſprinkled fine with a bruſh, by ſtriking it either againſt the hand, or a ſtick, unleſs it ſhould be marbled; for then the ſpots are to be made larger, by mixing the ink with vitriol. Then the cover is glazed twice with the white of an egg beaten, as painters do their pictures when they are finiſhed, and at laſt poliſhed with a poliſhing-iron paſſed hot over the glazed cover.

Thus the binding of a book, properly ſo called, is finiſhed, unleſs it ſhould be lettered; for then a piece of red Morocco is paſted on the back, between the firſt and ſecond bands, to receive the title in gold letters, and ſometimes a ſecond betwixt the next bands underneath, to receive the number of the volume. In France, they ſeldom bind any book without both, if the work conſiſts of ſeveral volumes; which done, the book-binder ſends his books to the gilder, which in that kingdom is a profeſſion apart, or ſeparate from book-binding.

The gilder makes the letters on the back, and the roſes, ſtars, &c. between the bands, with puncheons engraven in relievo, which they preſs flat down, and the lines, embroideries, &c. with little cylinders of braſs, rolled along by an iron roller, by means of a double branch; in the middle whereof they are fitted on an iron ſtay, or axis, that paſſes the middle of their diameter. Before they apply any of theſe tools, they glaze thoſe parts of the leather whereon they are to be applied, lightly over with a pencil, or ſponge; and when half dry, lay over them pieces of leaf gold, cut out near the ſize; and on theſe ſtamp the puncheons, which are beat down with a mallet, or hammer, if the figures be large, and require a great relievo, as arms, &c. or roll the cylinders, both the one and the other, reaſonably hot. The gilding thus finiſhed, they rub off the ſuperfluous gold with a hare's foot, leaving nothing covered with gold, but the places whereon the hot tools have left their impreſſions.

BOOK-KEEPING, commonly called merchants accounts, is the art or method of diſpoſing a man's dealings or tranſactions in ſuch a manner as will enable him to diſcern by his books the true ſtate of his affairs, not only in reſpect of what is due to and from himſelf, but alſo the quantity of every par-

particular kind of goods he has in his ware-house, either on his own account or for others, together with the particulars of the purchase or disposal, gain or loss, attending each separate species.

There are three principal books for conducting this useful invention, viz. a Waste-Book, Journal, and Ledger, which are absolutely necessary. Besides these, there are other subsidiary books, such as the Letter-Book, Ship's-Book, Receipt-Book, Bill-Book, Invoice-Book, Sales-Book, Book of Accounts Current, Warehouse-Book, Book of Expences, and the Cash-Book; but these subservient or auxiliary books are more or less in number according to the nature of the trade, quantity of business, or method of keeping the accounts; and he is reckoned the most expert accomptant, who makes use of the fewest auxiliary books.

The Waste-Book contains all the transactions which are done every day, which ought to be set down, together with all the particulars relating thereto, in a plain, easy, and familiar stile, serving only to give a description of the affair that hath been negotiated, just in the manner it happened, and according to the time they succeed each other; and it is the foundation on which both the Journal and Ledger depend, or from which they are erected.

This book opens with an inventory of the merchant's ready money and effects, the debts due to him, and what he owes to others; after which follows a minute and accurate record of every transaction, with all the necessary circumstances of date, sums, conditions, quantity, quality, price, and every other particular, that may help to render the entries satisfactory to the present and all succeeding book-keepers. Upon this book you may observe four lines are drawn (as in the following examples) through the length of it; three of which, namely, those on the right-hand side of the leaf, are put to serve for columns in which the pounds, shillings, and pence, relating to the article transacted is to be writ down; and the other column at the left-hand and in the margin, serves for the putting a mark therein, to signify that the said article is journalized, or posted from thence into the Journal; it is usually thus *l*. The following is an example of opening a Waste-Book, and the manner of writing the transactions of the day.

WASTE-BOOK.

London, January 1, 1765.

		£.	s.	d.
	An INVENTORY *of the Money, Goods, Debts, &c. belonging to me* JAMES HENDY, *taken this Day, viz.*			
l	IN ready money - - - - - - - -	500	00	00
	7 Pipes of red-port, at 25l. per pipe -	178	10	00
	J. Hammond owes me a note on demand	200	00	00
	I owe as follows:			
l	To Phil. Hendy, per note due the 9th instant - - - - - - - -	100	00	00

London, January 3, 1765.

		£.	s.	d.
l	BOUGHT of James Hervey, 3 pipes of Malaga wine, at 25l. 10s. per pipe, for which I paid - - - - 6	76	10	00
	SOLD Joseph Berwick, a piece of broad-cloth, upon trust, for - - - 9	16	10	00
	PAID Phil. Hendy in full - - - -	100	00	00

The Journal is a kind of preparatory for the Ledger; for it is in this book that all transactions recorded in the Waste-Book are digested, their proper Debtors and Creditors ascertained; it is also of excellent use, both to prevent errors in the Ledger, and to correct them when made; for without it the balancing a set of books, in case of any mistake, would be extremely difficult and tedious.

Upon this book you must draw five lines, (as in the following examples) three of which, namely, those on the right-side of the leaf, are put to serve for columns in which the pounds, shillings, and pence, relating to the article transacted are to be writ; in like manner as upon the Waste-Book; and the other column at the left-hand serves to set down the folios of the Ledger on which all the accounts that are said in the Journal to be Debtors and Creditors stand: the folio of that account which is Debtor being always uppermost, and that of the Creditor under it, parted one from the other by a line in form of a vulgar fraction, thus $\frac{3}{4}$. It must also be remarked, that the titles of the several accounts in the Journal which are made Debtors and Creditors, in entering transactions of affairs therein, must be wrote in characters larger than any of the rest of the writing relating to it, and contained in one line if practicable. Under this line you must express the reason why such a person, account, or design, is made debtor, with the particular conditions of the negotiation; likewise the weight, measure, &c. of each particular parcel, or package, which is received in, or delivered out, at the price agreed upon, with the sum total in the money columns. In those entries where there are sundry Debtors to one Creditor, or several Creditors to one Debtor, the several Debtors, or Creditors, are entered in the first line, after the date, under the title of Sundries, or Sundry Accounts, and each particular Debtor and Creditor afterwards expressed below, with the respective sums short-carried.

The greatest difficulty that chiefly arises to young students in the art of book-keeping, is finding the proper Debtor and Creditor to each article in the Waste-Book, or more properly to Journalize. The authors that have lately written on this subject, have given such a multiplicity of rules, that we apprehend they rather hinder, perplex, and puzzle, than facilitate or explain this point; nor do we think there is occasion for any other rule than

what Mr. Webſter has given, viz. "That whatever we receive, or the perſon receiving is Debtor, "or whatever you deliver, or the perſon delivering "is Creditor." Whatever money, goods, and debts, a merchant is poſſeſſed of, compoſe his ſtock, which in order to diſpoſe properly for trade, each ſeparate article muſt at the beginning be charged Debtor to Stock; as on the other hand, Stock muſt be made Debtor to the ſeveral perſons to whom you are indebted. The following example, which is taken from the foregoing example of the Waſte-Book, will illuſtrate the above rule.

JOURNAL.

London, January 1, 1765.

		£.	s.	d.
	SUNDRIES Dr. to STOCK.			
2/1	Caſh in ready money - - 500 00 00			
3/1	Red-port, for 7 pipes at 25l. 10s. per pipe - 178 10 00			
4/1	James Hammond owes per note on demand 200 00 00			
		878	10	00
	STOCK Dr. to SUNDRIES.			
1/3	To Phil. Hendy, due per note - -	100	00	00
	3			
	MALAGA WINE Dr. to CASH 76l. 10s.			
5/2	Bought 3 pipes at 25l. 10s. per pipe -	76	10	00
	6			
	JOSEPH BERWICK Dr. to BROAD-CLOTH, 16l. 10s.			
6/3	Sold him one piece upon truſt - -	16	10	00
	9			
	PHIL. HENDY Dr. to CASH 100l.			
1/2	Paid him in full - - - - - -	100	00	00

The Ledger is the grand and principal book of accounts, wherein the ſeveral articles belonging to the ſame ſubject, are collected together, and ranged in their natural order of Debtor and Creditor, on the oppoſite ſides of their reſpective accounts. When this book is duly poſted, the various tranſactions and dealings of a merchant with reſpect to men, money, and merchandize, are ſo regulated and diſpoſed under their proper heads, that they afford a comprehenſive view of all his negociations, from which a compleat balance of his traffic being made, he may at any time ſee the true ſtate of each branch of his buſineſs, and know the amount of his preſent ſtock, or what he is worth at that time.

Upon this book you may obſerve, as in the following example, that there are two leaves of paper allowed for each account, facing each other: likewiſe that the title of the account with the letters Dr. are wrote on the left-hand leaf or folio in large characters; and the words PER CONTRA, with the letters Cr. in the ſame manner on the right-hand leaf.

You muſt likewiſe obſerve, that on each of the leaves of every account, there are ſix lines ruled or drawn at length, four of which are on the right hand of each leaf, and two on the left, forming as many columns. The three columns to the right-hand are for the pounds, ſhillings, and pence, and the fourth for the folio. The two columns to the left-hand are one for the year and month, and the other for the day of the month. Beſide which ſome draw, or make another column to the left, for references to the Journal page; and others to the right, for the quantity and weight of goods, foreign money, &c. as the nature of the account requires.

See the following example of the article Malaga wine, in the foregoing Journal, poſted.

THE LEDGER.

1765.		(2) CASH Dr.	F.	£.	s.	d.
1765.		(2) PER CONTRA Cr.	F.	£.	s.	d.
Jany.	3	By Malaga wine, at 25l. 10s. for 3 pipes - -	6	76	10	00
1765.		(6)				
Jany.	3	MALAGA WINE Dr.				
		To Caſh, at 25l. 10s. for 3 pipes - - - -	2	76	10	00
		(6)				
		PER CONTRA Cr.				

The firſt thing to be done in poſting or tranſferring accounts from the Journal to the Ledger, is to title the Ledger; that is to write it in a large fair hand, at the top of the folio, and at ſuch diſtances below as your judgment ſhall direct, the ſeveral names contained in the firſt lines of your Journal entries, except where the word Sundries is mentioned, when, inſtead of which, thoſe names at the beginning of the ſubſequent lines are to be wrote, taking care not to make two titles alike, which may be avoided by keeping an alphabet of the different accounts, with the folios on which they

they are entered in the Ledger, and having frequent recourſe to that.

Secondly, as all entries in the Ledger are double, you muſt be careful never to make a Debtor without a Creditor; that is, as in the foregoing example, if Malaga Wine be Debtor to Caſh, Caſh muſt be Creditor to Malaga Wine. Or if any other account be Debtor to Sundries, which ſignifies two or more particulars, thoſe ſeveral accounts muſt each ſeparately be made Creditors for the ſum which that particular account was Debtor.

The method of tranſpoſing accompts from one folio of the Ledger to another; how to prove the truth of your poſting by a trial balance; the method of examining the book, and correcting the errors; how the real balance is drawn out, and a new ſet of books opened from it, &c. take as given in a treatiſe on this ſubject, by Mr. John Cook, maſter of the academy in Charles-ſtreet, St. James's-ſquare, viz.

"The method of tranſpoſing Accompts from one folio in the Ledger to another.

"If at any time the ſpace allotted for an Accompt ſhould be ſo filled with articles as to make it neceſſary to remove it to another folio in the Ledger, it may be done by one or other of the following methods, viz.

"1ſt. If it be an Accompt, where the difference between the Debtor and Creditor, with reſpect to money, is only conſidered, as is the caſe in all Accompts of Perſons, Caſh, Profit and Loſs, &c. add up both ſides, and make the new Accompt Debtor to the old, for the Balance or difference, if the Debtor ſide be heavieſt; but, if the Creditor ſide be heavieſt, make the old Accompt Debtor to the new.

"2ndly, If it be an Accompt of Goods, &c. add up the ſides, and make the new Accompt Debtor to the old, for the whole quantity and price of the Goods bought; and the old Accompt Debtor to the new, for the total quantity and price of thoſe ſold; by which means the old Accompt will be balanced, and on the new one will appear both the quantity of goods bought, with the ſum paid for them, and thoſe which have been ſold, with the money received, as was before on the old Accompt.

"How to prove the truth of your Poſting, by making a Trial balance.

"The way to make a Trial balance is, to add up all the money on the Debtor ſides, throughout the whole Ledger, into one ſum, and all on the Creditor ſides into another; if both totals come alike, you may conclude your Poſting is right; for, as I have already obſerved, every entry in the Ledger is double, that is, no accompt is ever charged Debtor, but ſome other is, or ought to be, Credited with the like ſum, by which it is plain, there are juſt as many Creditors as there are Debtors; and conſequently (if the accompts have been properly poſted) both ſides muſt exactly agree.

"The method of examining the books and correcting errors.

"If upon making the Balance above-mentioned, there ſhould be a diſagreement in the totals, you may then reaſonably conclude (provided no miſtake is made in the adding) that you have omitted either the Debtor or Creditor, or charged them with different ſums, or elſe entered ſome parcel in both accompts, either on the Debtor or Creditor ſide, any of which errors will be diſcovered by pricking over your Ledger; that is, beginning at the firſt accompt, which is Stock Debtor to Caſh, and againſt the ſum make a dot thus (.), then turn to the Creditor folio, and mark that in like manner, proceeding thus with every entry throughout the book; and having by this means diſcovered the miſtake, rectify it by one of the following methods, viz.

"If the Debtor or Creditor is omitted, it is corrected by charging which ever of them is in its proper accompt.

"If the Debtor or Creditor be charged with different ſums, it is rectified (if either of them be charged too much) by making the oppoſite ſide Debtor to, or Creditor by error for the exceſs; if too little, by charging it again Debtor to, or Creditor by its counterpart for the deficiency.

"When a parcel is entered in both accompts on the ſame ſide, it is adjuſted, by making the oppoſite ſide Debtor to, or Creditor by error, for the ſum of the article wrong placed; then, enter the article in its proper place, by which means the miſtake will be Balanced, and the Accompt left properly ſtated. After this manner are all errors in Book-keeping corrected, and not by cancelling or eraſing, which Merchants never admit of.

"How the real Balance is drawn out, and a new ſet of books opened from it.

"Balancing the Ledger, is adding up the Debtor and Creditor ſides of the ſeveral accompts ſeparately; the difference of which being poſted on the defective, or lighteſt ſide, will make both even; and, conſequently, the accompt become Balanced. In doing which the following rules muſt be obſerved.

"In the firſt place, erect in the Ledger an accompt of Balance, to which the difference between the Debtors and Creditors in the accompt of Caſh, and alſo in accompts of men, together with the quantity and prime coſts of all goods remaining in your hands, muſt be carried; as for example. Let it be ſuppoſed, that the Debtor ſide of Caſh contains 15,000l. and the Creditor 10,000l. the difference then being 5000l. (which is the money you have by you) it muſt be entered on the Creditor ſide, in order to balance the accompt, by making

Cash creditor by Balance 5000l. and consequently, Balance will stand Debtor to Cash 5000l. So in the Accompts of men, if the Debtor be the heaviest, the difference is the money due to you; which, in order to make the accompt even, must be brought on the Creditor side; therefore Balance will again be charged Debtor for the like sum, and *vice versa*. I have already mentioned, that whatever goods remain unsold are carried to Balance; but, as Accompts of goods admit of three varieties, I shall treat of each separately.

"The first then is, when none are sold.

"In this case, the Accompt is made even, by being Credited by Balance, for the whole quantity at prime cost.

"The second is, when all are sold.

"In which case the Accompt is balanced by Profit and Loss only, by being charged Debtor to, or Creditor, by that accompt, for the gain or loss arising from the sale of the goods.

"The third is, when only part of the Goods are sold.

"And here, both the accompts of Balance and Profit and Loss are concerned; for, in the first place, the Goods must be Credited by Balance, for those remaining at prime cost; and afterwards made Debtor to, or Creditor by Profit and Loss, for the Gain or Loss on those that are sold.

"The other accompts, such as Charges of merchandize, House-expences, &c. as they are disbursements from which no return can be expected, are all balanced by Profit and Loss, which, together with Stock and Balance, stand open 'till the last; and, in order to Balance them, begin with Profit and Loss, and make it Debtor to, or Creditor by Stock, for the difference of the sides, which is your whole Gain or Loss by trade; then add up the accompt of Stock, and close it by carrying the difference, which is your neat estate, to Balance; by which means the said accompt of Balance will become evened; the Debtor side of which will present you with a distinct account of all the Money, Goods, and Debts you are possessed of; and the Creditor side with an account of whatever is due from you to others; and consequently, contains, or rather is, an inventory of your effects, with which a new set of books are opened; for the better understanding of which, compare the Balance of the first set with the Inventory of the second.

"I shall now in the last place examine the methods made use of in keeping Company accompts.

"There is no part of Book-keeping that admits of greater variety, or is so extensively useful, as that which is called Company accompts, there being few Merchants, who have any considerable dealings, but what are concerned in Partnership; notwithstanding which, it has been treated of by the majority of writers upon this subject, in the most superficial manner, and they are still divided in the method of Journalizing those cases relating to Goods in company being sold upon trust; some chusing to make the buyer Debtor to the Goods in company; and then the Partner's accompt company Debtor to his accompt current, for his half share of the money due; by which method, it is evident, your Partner's accompt current (which is what should particularly shew the money due, either from, or to the person) becomes Credited for a sum you, at present, do not owe him, by reason of your not having received it; and, if never paid, are not accountable for. There is also another obvious objection, which naturally arises to this method: and that is, when Goods are paid for at different times, in order to know what money is due to your Partner, recourse must be had to the Purchaser's accompt; and if sold, for part money, part time, both the Goods in company, and Purchaser's accompt, must be referred to, as it is impossible, amidst a multiplicity of business, to charge the memory with things of this nature, neither would it be proper so to do.

"By the other method made use of (which is that I shall pursue), all the above objections are removed; for as here no notice is taken of money due to your Partner, 'till such time as it is received, the Accompt company will remain open; and, as the payments are made, be charged Debtor to the current for your partner's share of the sum, by which means he will be Credited for his part of whatever money has been received; and consequently, his Accompt current will plainly shew what he has a right to demand of you. If any object, that, when the Goods are sold, the accompt company, as it shews your partner's share in them, ought to be closed; I answer: the Goods in company is the proper accompt to have recourse to for their disposal, that the Accompt company then answers the purpose of an Accompt at time, and may be balanced in the same manner, as it shews what money is due at Time to your Partner."

BOOKSELLER, one who trades in books, whether he prints them himself, or gives them to be printed by others.

BOOM, in the fortification of a harbour, a strong chain or cable, on which are fastened a number of poles, &c. extending athwart the entrance of an harbour or river, to prevent the enemies ships of war from coming in: it may occasionally be sunk, or drawn up to the surface of the water, by capsterns and other mechanical powers.

Captain Park, in his Defensive War by Sea, published anno 1704, will furnish the reader, who is curious to understand the construction of these machines, with a particular account of their being

being prepared and fixed, which is alſo quoted into the Seaman's Vade-Mecum; but as they have not been much uſed of late, we ſhall ſay no more of them ourſelves, and far leſs exhauſt our reader's patience with ſo clumſy and laborious a detail.

BOOMS, in the marine, long poles run out from different places in a ſhip, to extend the bottom of certain ſails: of theſe there are ſeveral ſorts, as the jib-boom, ſtudding-ſail booms, main-boom, and ſquare-ſail boom; theſe two laſt are only appropriated to ſmall veſſels.

BOOM is likewiſe a general name for all maſts and yards.

BOOPHTHALMUS, a kind of agate with large circles in it, bearing ſome reſemblance to an ox's eye, from whence it has got this name.

BOOT, a well-known cover for the leg, made of leather.

BOOT-TREE, or BOOT-LAST, an inſtrument uſed by ſhoe-makers to widen the leg of a boot. It is a wooden cylinder ſlit into two parts, between which, when it is put into the boot, they drive by main force a wedge or quoin.

BOOT-TOPPING, in the marine. When either from the want of a dock, or other convenient ſituation, or through the hurry of her voyage, a ſhip cannot get her whole bottom properly trimmed and cleanſed of the filth which adheres to it in the courſe of a ſea-voyage; they uſually make her lean or heel firſt to one ſide, and then to the other, as much as they may do it without danger of overturning her, in order to ſcrub off the graſs, ſlime, ſhells, or other excrement; which having performed, they cover all that part of the bottom which is elevated above the ſurface of the water on one ſide, as the ſhip heels, with a maſs of ſulphur, tallow, and other materials, and afterwards perform the ſame on the other ſide, both to preſerve it from the worm, and to make the ſhip ſlide ſmoother through the water. See CAREEN, DOCK.

BOOTES, in aſtronomy, a conſtellation of the northern hemiſphere, conſiſting of fifty-four ſtars in the Britiſh catalogue, twenty-eight in Tycho's, twenty-three according to Ptolemy, thirty-four in Bayer's, and fifty-two in Hevelius's.

According to fabulous hiſtory, this Bootes is ſuppoſed to be Arcas, the ſon of Caliſto, daughter to Lycaon, king of Arcadia. The poetical ſtory is thus: Lycaon receiving Jupiter into his houſe as a gueſt, took Arcas, his daughter's ſon, cut him into pieces, and placed him before Jupiter to eat, thinking by that means to prove whether his viſitor was a god, which he had pretended to be. Jupiter perceiving the heinous fact, overturned the table, fired the houſe with lightning, and transformed Lycaon into a wolf; after which he gathered up the limbs of Arcas, put them together, and committed him to a nymph of Etolia, to be taken care of. When Arcas, Bootes, or Artophilax, was come to man's eſtate, and was hunting in the woods, he by chance met with his mother Caliſto, whom Juno had turned into the ſhape of a bear, and purſued her into the temple of Jupiter Lycæus, which, by the law of the Arcadians, was death for any man to enter: therefore Jupiter, fearing leſt both ſhould be ſlain, Caliſto by her ſon, and Arcas by the law, out of pity tranſlated them both into heaven.

There is only one unformed ſtar in this conſtellation, which is between Bootes' legs, and by the Grecians is called Arcturus, becauſe of all the ſtars near the Bear, named Arctos, this ſtar is firſt ſeen near her tail in the evening; the poetical invention concerning which is thus: Icarus, the father of Erigone, having received of the god Bacchus a flagon of wine, to declare how good it was for mortal men, took it along with him into the territories of Athens, where carouſing with it among certain ſhepherds, who being delighted with the pleaſantneſs of the wine, which was a new kind of liquor to them, drank very freely, and were quickly glad to lay their heads to reſt: but coming to themſelves again after ſome time, and finding their heads ſcarce in good temper, they killed Icarus, ſuppoſing that he had either poiſoned them, or given them ſomething to intoxicate their brain. Erigone was ready to die for grief; but Jupiter, to allay her ſorrow, placed her father in heaven between the legs of Bootes.

Bootes by ſome is called the Waggoner, becauſe he is ſuppoſed to drive Charles's-wain, which is drawn by three oxen. Others call him Artophilax, and ſuppoſe him to be the keeper of the bear, or that the care of the bear is committed to him.

In the following Catalogue you have the right aſcenſions and declinations ſettled to the year 1770; likewiſe the annual variation in right aſcenſion and declination in ſeconds and tenths.

Order.	Magn.	Name.	Bayer's Let.	Right Aſcenſion	Diſtance from No. Pole.	Var. in Right Aſcen.	Var. in Declination
				° ′ ″	° ′ ″	″	″
1	6			202.25.31	68.52. 9	43,4	18,6
2	6			202.32.24	66.20. 0	43,3	18,5
3	6			204. 0.28	63. 8.10	43,2	18,4
4	4			204. 5.10	71.23.39	43,4	18,3
5	4		τ	204.35.51	73. 3.20	43,39	18,25
6	5		υ	204.42.34	67.35.20	43,3	18,2
7	7			205.33.27	70.55.39	43,4	18,1
8	3		η	205.55.48	70.25.47	43,4	18,0
9	5			206.31.36	71.22.31	42,6	17,9
10	7		ι	206.57.55	67.11.28	42,8	17,8
11	6			207.41.52	61.30.25	42,6	17,6
12	6			209.58.25	63.49. 2	42,6	17,5

Order.	Magn.	Name.	Bayerian.	Right Aſcenſion	Diſtance from No. Pole.	Var. in Right Aſcen.	Var. in Decli-nation.
				° ′ ″	° ′ ″	″	″
13	5			210. 1.23	39.27.17	42,3	17,4
14	6			210.45.54	75.57.27	42,4	17,3
15	6			210.53.58	78.48.32	42,5	17,3
16	1	Arcturus	α	211.17.56	69.34. 2	42,3	17,2
17	4		κ	211.21.48	37. 7.51	34,1	17,2
18	6			212. 1.43	75.56. 1	43,4	17,2
19	4		λ	212.56.16	42.51.28	34,8	17,1
20	5			212.12.49	72.38.48	43,3	17,1
21	4		ι	213. 3.54	37 35.55	34,4	17,1
22	5			213.56.27	69.44.44	42,2	16,8
23	4		θ	214.23.24	37. 4.24	30,9	16,6
24	7		g	215.10.41	39. 7.41	30,1	16,3
25	4		ε	215.24.31	58.29 41	39,1	16,3
26	7			215.30.23	66.43.51	39,5	16,3
27	3		γ	215.41.37	50.41.22	36,6	16,3
28	5		σ	216. 9.37	58.15.33	39,5	16,2
29	3		π	217.28.16	72.35.17	42,3	16,1
30	3		ζ	217.31.31	75.17.43	42,9	15,9
31	5			217.34.25	80.51.12	42,5	15,9
32	6			217.38.39	77.21.12	42,4	15,9
33	6	1ma ad	h	217.35.19	44.35.48	34,8	15,9
34	6			218.19.21	62.29.29	39,5	15,8
35	5		o	218.37.23	72. 3. 5	42,2	15,8
36	3		ε	218.43.27	61.57. 6	39,5	15,7
37	4		ξ	219.11.16	69.56 23	42,0	15,5
38	6	2da ad	h	220.16.52	42.55. 7	32,2	15,4
39	6			220.38.39	40.19.48	31,2	15,2
40	7			222 41.13	49.48.19	34,8	15,1
41	5		ω	222.59.56	64. 5. 2	39,5	14,9
42	3		β	223.20.27	48.41.58	34,7	14,6
43	5		ψ	223.37.20	62. 9.21	39,5	14,5
44	6			224. 2.19	41.28. 0	30,2	14,4
45	5			224.14 20	64.13.52	39,5	14,3
46	6			224.34.24	62.48.54	39,5	14,1
47	7			224.50.27	63.40. 7	39,5	13,0
48	5		χ	226.11.55	59.59. 1	39,2	13,9
49	3		δ	226.34.32	55.50 4	36,3	13,8
50	6			228. 9.58	56.14.20	36,3	13,6
51	4		μ	228. 8.23	51.52. 8	34,7	13,3
52	6	1ma ad	ν	230.40.27	48.22.57	34,1	12,7
53	6	2da ad	ν	230.54. 6	48.18.53	34,1	12,6
54	6		φ	232.26. 6	48.53.46	34,1	12,2

BOOTY, whatever is taken from an enemy in time of war.

BOQUINIANS, in church hiſtory, a ſect of heretics, ſo called from Boquinus their founder, who taught that Chriſt did not die for all mankind, but only for the faithful, and conſequently was only a particular Saviour.

BORAGO, borage, in botany, a pentandrious plant, whoſe root is thick, fibrous, and white, from which ſpring forth ſeveral broad, roundiſh, rough, wrinkled leaves, of a darkiſh green colour, which lie on the ground; the ſtalk is hairy, round, hollow, branched, and furniſhed with leſſer leaves, which are placed alternately; the flowers, which grow on the tops of the branches, are generally blue, though ſometimes reddiſh, or of a whitiſh colour; theſe are monopetalous, each having a ſhort tube, and divided into five ſharp-pointed ſegments; in the center are placed four germen, and a ſingle ſtile, ſurrounded by five ſubulated filaments, which are joined together; the germen afterward becomes ſo many rough, roundiſh ſeeds: this plant is annual, and grows wild in many parts of England. The leaves of borage are accounted cordial, and good in removing faintneſs, for which reaſon the tops are frequently put into wine and cool tankards. Boerhaave recommends the expreſſed juice in all inflammatory diſeaſes; the only officinal preparation is the conſerve of the flowers.

BORAX, a fabulous animal, ſaid to be of a middle nature, between an aſs and a mule, and to have carried Mahomet in his aerial journies from Jeruſalem into Heaven.

BORAX, a ſaline ſubſtance, of which neither the origin, or the component parts are as yet known. It comes from the Eaſt-Indies in little cryſtalline maſſes, ſomewhat reſembling ſmall cryſtals of ſal gem, mixed with earth and other impurities.

It is commonly ſaid, that borax is prepared in the eaſtern countries, from a green ſaline liquor, which runs from certain hills, and is received in pits lined with clay, and ſuffered to evaporate by the ſun's heat; that a bluiſh mud, which the liquor brings along with it, is frequently ſtirred up, and a bituminous matter which floats upon the ſurface taken off; that when the whole is reduced to a thick conſiſtence, ſome melted fat is mixed, the matter covered with dry vegetable ſubſtances, and a thin coat of clay; and that when the ſalt has cryſtallized, it is ſeparated from the earth by a ſieve.

In the ſame countries is found, in conſiderable quantities, a native mineral alkaline ſalt on the ſurface of the earth, ſometimes tolerably pure, more commonly blended with heterogeneous matters of various colours; the nitrum or natron of the ancients, the baurach of the Arabians. This alkali appears to be the ſame with the baſis of the ſea-ſalt, and with the lixivial ſalt of kali or kelp, and ſome other maritime plants. It differs from the common vegetable alkalies, in being milder and leſs acrid in taſte, aſſuming a cryſtalline appearance, not deliquiating in the air, or very ſlowly; forming with the marine acid a perfect ſea-ſalt, with the nitrous quadrangular nitre, and with the vitriolic, a ſal mirabile.

Mr. Pott received from Tranquebar, (where the greateſt quantities of borax are made) a ſand, under the name of ore of borax, with an account that cer-

certain acrid vegetable matters were added in the preparation of the borax. The ore yielded, on elixation, only the mineral alkali, with a little ſea-ſalt.

The mineral alkali appears, from experiment, to be a principal ingredient in borax. On treating borax with acids, about one fourth its weight of a peculiar ſaline ſubſtance, called ſedative ſalt, is ſeparated, and the reſiduum proves a combination of the alkali, with the acid employed: thus, when the marine acid is uſed, a genuine ſea-ſalt remains; when the nitrous, a quadrangular nitre; and when the vitriolic, a ſal mirabile. The ſubſtance ſeparated, joined to the mineral alkali, to the baſis of ſea-ſalt, or to the ſalt of kali, recompoſes borax again.

The properties of this ſubſtance, ſo far as they are known, are theſe: It is of a bright ſnowy whiteneſs, extremely light, compoſed of fine plates or ſcales, ſoft, and as it were unctuous to the touch, of no ſmell, of a bitteriſh taſte, accompanied with a ſlight impreſſion of coldneſs. It diſſolves difficultly in boiling water, and on the liquor's cooling, cryſtallizes on its ſurface into thin plates, which uniting and becoming larger, fall to the bottom. It likewiſe diſſolves, by the aſſiſtance of heat, in rectified ſpirit of wine: the ſolution ſet on fire burns with a green flame. Moiſtened and expoſed to a conſiderable heat, it in part ſublimes; by repeated humectations the whole may be elevated: whilſt dry, it proves perfectly fixed; it melts, emits aqueous vapours, and runs into a vitreous ſubſtance, diſſoluble again as at firſt: neither the glaſs nor the ſalt itſelf are affected by the air. It makes no change in the colour of blue flowers. It unites with the common alkaline ſalts, in ſome degree neutralizes, and renders them capable of cryſtallization. It is ſaid to expel from alcalies every acid except the vitriolic, though expelled itſelf by every acid from the alcaline baſis of the borax.

Thus we find borax compoſed of two principles, one every where plentiful, another which has not hitherto been obtained but from borax itſelf; the laſt in the ſmalleſt proportion. How far this peculiar ſubſtance is natural or artificial, of mineral or of vegetable origin, is wholly unknown.

With regard to the refining of borax, the rough ſalt is ſaid by ſome to be diſſolved in lime-water, by others in a lixivium of cauſtic alkali, and by others in alum-water. This much is certain, that borax diſſolved in common water, and cryſtallized in the common manner, forms extremely ſmall cryſtals: that theſe differ in ſeveral reſpects from the refined borax of the ſhops, inſomuch that Cramer calls the latter not a purified but adulterated borax; that borax ſhoots into larger cryſtals when diſſolved in lime-water, than in common water; and when the veſſel is covered, and a gentle warmth continued during the cryſtallization, than in other circumſtances.

It is obſervable, that borax, during its diſſolution, appears tenacious, and adheres in part to the bottom of the veſſel: from this glutinous quality, peculiar to borax among the ſalts, it is employed by the dyers for giving a gloſs to ſilks. It is alſo of the greateſt uſe in ſoldering metals. See SOLDERING.

BORBONIA, in botany, a genus of diadelphious plants, the flower of which is pentapelous and papilionaceous; the fruit is a round pointed pod, with one cell, containing a kidney-ſhaped ſeed. One of the ſpecies of borbonia grows naturally at the Cape of Good-Hope, where it riſes to the height of ten or twelve feet, having ſlender ſtems dividing into ſeveral branches, which are furniſhed with ſtiff leaves, placed alternately, and are narrow, long, and acuminated; the flowers come out from between the leaves at the ends of the branches, and are yellow, much reſembling thoſe of broom.

BORBORITES, *Borboritæ*, in church hiſtory, a ſect of Gnoſtics in the ſecond century, who, beſides embracing the errors of theſe heretics, denied the laſt judgment.

Their name comes from βορβορος, filth, on account of a cuſtom they had of daubing their faces and bodies with dirt and filth.

BORDAT, in commerce, a ſmall narrow ſtuff, which is manufactured in ſome parts of Egypt, particularly at Cairo, at Alexandria, and at Damieta.

BORDERS, in gardening, are of four ſorts: thoſe are the moſt common that are continued about parterres without any interruption, and wrought with a gentle riſing in the middle, like an aſs's back, and planted with low ſhrubs and flowers.

The ſecond ſort of borders are ſuch as are cut into compartments, at convenient diſtances, by ſmall paſſages, and being alſo raiſed in the middle, as before-mentioned, are likewiſe ſet off with ſhrubs.

The third ſort are ſuch as are laid even and flat, without flowers, having only a verge of graſs in the middle, being edged with two ſmall paths, raked ſmooth and ſanded. Theſe are ſometimes garniſhed with flowering ſhrubs, and flowers of large growth; or with vaſes and flower-pots placed regularly along the middle of the verge of graſs.

The fourth ſort are quite plain, and are only ſanded, as in the parterres of orangery; and are filled with caſes ranged in a regular order along thoſe borders, which are edged with box on the ſides next the walks; and on the other, with verges and graſs-work next the parterre. Sometimes a yew is planted between each caſe, which makes the border appear richer, and the parterres handſomer, during the winter ſeaſon.

Bor-

Borders are either made ſtraight, circular, or in cants; and are turned into knots, ſcrolls, volutes, and other compartments.

Floriſts alſo make borders, either in long walks, or detached; and in theſe they raiſe their fineſt and choiceſt flowers. Theſe are frequently encompaſſed with border-boards painted green, which makes them look exceeding neat.

But in large parterres, this is not to be expected; ſince if they be ſtocked with flowers, ſucceeding one another in their ſeveral ſeaſons, it is ſufficient, ſo that nothing appears bare and naked.

It is uſual to diſcontinue the borders at the ends next to the houſe, that the embroidery and riſe of the parterre may not be hidden by the ſhrubs and flowering plants, and that the deſign may be better judged of.

And ſometimes there are branched out of it foliage, palm-leaves, and ſhells ſporting among the ſands.

As the modern taſte of parterres, ſcroll borders, and fret-work in box, has been juſtly baniſhed our gardens: ſo I have only mentioned them here, to expoſe the taſte of thoſe architect-gardeners, who have no idea of the noble ſimplicity of an open lawn of graſs, properly bounded by plantations; but inſtead of this, divide that part of the garden, near the houſe, into various forms of borders edged with box, and ſand or gravel-walks leading about them; by which the ground is cut into many angles, ſcrolls, &c. which is very hurtful to the eye of a judicious perſon; therefore, where flowers are deſired, there may be borders continued round the extent of the lawn, immediately before the plantations of ſhrubs; which, if properly planted with hardy flowers to ſucceed each other, will afford a much more pleaſing proſpect than the ſtiff borders made in ſcrolls and compartments, after the French manner, can poſſibly do.

Theſe borders may be made ſix or eight feet wide, in proportion to the extent of the garden, and ſize of the lawn: for a ſmall lawn ſhould not have very broad borders; nor ought a large lawn to be bounded by ſmall borders; ſo that a due proportion ſhould be always obſerved in the laying out of gardens. *Miller's Gardener's Dictionary.*

BORD-FREE. See the article FREE.

BORD-HALFPENNY, a ſmall roll, by cuſtom paid to the lord of the town for ſetting up boards, tables, booths, &c. in fairs and markets.

BORD-LANDS, the demeſnes which lords keep in their hands for the maintenance of their board or table.

BORD-LODE, a ſervice required of tenants to carry timber out of the woods of the lord to his houſe. It is alſo uſed to ſignify the quantity of proviſion which the bordarii or bordmen paid for their bord-lands.

BORD-SERVICE, the tenure of bord-lands, by which ſome lands in certain places are held of the biſhop of London, and the tenants now pay ſixpence per acre, in lieu of finding proviſion anciently for their lord's table.

BORDURE, in heraldry, a cutting off from within the eſcutcheon all round it, about one fifth of the field, ſerving as a difference in a coat of arms, to diſtinguiſh families of the ſame name, or perſons bearing the ſame coat. If the line conſtituting the bordure be ſtraight, and the bordure be plain, then in blazoning you muſt only name the colour of the bordure.

Bordures are ſometimes ingrailed, gobonated, invected, &c. See the articles INGRAILED, &c.

If the bordure be charged with any part of plants or flowers, the term is verdoy of trefoils, or whatever flower it be. If it conſiſts of ermins, vairy, or any of the furs, they ſay purflew of ermins, &c. If the bordure be charged with martlets, the word is charged with an enalyron of martlets, &c.

Bordures are ſymbols of protection, favour, and reward, and as ſuch, kings beſtow them on thoſe they have a value for.

BORE, among engineers, denotes the diameter of the barrel of a gun, or cannon, or rather its whole cavity.

Square BORE, among mechanics, a ſquare piece of well-tempered ſteel, fitted into a handle, ſerving to widen holes, and making them perfectly round.

BOREAL, in a general ſenſe, ſomething relating to the north. Thus,

BOREAL SIGNS, in aſtronomy, are thoſe ſix ſigns on the northern ſide of the equinoctial, or the firſt ſix ſigns of the Zodiac, viz. Aries, Taurus, Gemini, Cancer, Leo, and Virgo.

Aurora-BOREALIS. See AURORA.

BOREAS, a Greek name, now in common uſe for the north-wind.

Pezron obſerves, that anciently Boreas ſignified the north-eaſt wind, blowing at the time of the ſummer ſolſtice. Boreas is repreſented, in painting, like an old man with a horrible look, his hair and beard covered with ſnow or hoar-froſt, with the feet and tail of a ſerpent.

BORECOLE, *braſſica*, in botany, a ſpecies of the cabbage. See CABBAGE.

BORING, in a general ſenſe, the art of perforating or making a hole through any ſolid body.

BORING *of Water Pipes.* See PIPES.

BORING, in farriery, an operation in uſe for the cure of wrenched ſhoulders in horſes. It is this: having cut a hole in the ſkin, over the part affected, they blow it up with a tobacco-pipe, as a butcher does a ſhoulder of veal; after which they thruſt a cold flat iron, like the point of a ſword blade, eight or ten inches up between the ſhoulder-blade and the ribs: this they call boring.

BORING, in mineralogy, a method of piercing the earth with ſcooping-irons, which, being drawn back at proper times, bring up with them ſamples of the different ſtrata thro' which they have paſſed; by the examination of which the ſkilful mineraliſt will be able to gueſs whereabouts a vein of ore may lie, or whether it will be worth while to open a mine there or no.

BOROUGH, BURROUGH, BOROW, or BURGH, a corporation, or town, which is not a city. The word, in its original ſignification, meant a company, conſiſting of ten families, which were bound together as each other's pledge. Afterwards borough came to ſignify a town having a wall or ſome kind of enclоſure round it: and all places that in old time had the name of borough, it is ſaid, were fortified or fenced in ſome ſhape or other. Borough is a place of ſafety and privilege: and ſome are called free burghs, and the tradeſmen in them free burgeſſes, from a freedom they had granted to them originally, to buy and ſell without diſturbance, and exempt from toll.

BOROUGH is now particularly appropriated to ſuch towns or villages as ſend burgeſſes or repreſentatives to parliament, whether they be incorporated or not.

They are diſtinguiſhed into thoſe by charter or ſtatute, and thoſe by preſcription or cuſtom: the number in England is 149, ſome of which ſend one, but the moſt of them two repreſentatives.

Royal BOROUGHS, in Scotland, are corporations made for the advantage of trade, by charters granted by ſeveral of their kings, having the privilege of ſending commiſſioners to repreſent them in parliament, beſides other peculiar immunities. They form a body of themſelves, and ſend commiſſioners each to an annual convention at Edinburgh, to conſult the benefit of trade, and their general intereſt.

BOROUH-ENGLISH, a cuſtomary deſcent of lands or tenements, in certain places, by which they deſcend to the youngeſt inſtead of the eldeſt ſon; or if the owner have no iſſue, to the younger inſtead of the elder brother. This cuſtom goes with the land, although there be a deviſe or feoffment at the common law to the contrary. The reaſon of this cuſtom, ſays Littleton, is becauſe the youngeſt is preſumed, in law, to be the leaſt able to provide for himſelf.

BOROUGH-HEAD, or HEADBOROUGH, called alſo borough-holder, or burſholder, the chief man of the decenna, or hundred, choſen to ſpeak and act in behalf of the reſt.

Headborough alſo ſignifies a kind of head conſtable, where there are ſeveral choſen as his aſſiſtants, to ſerve warrants, &c. See the article CONSTABLE.

BORRELLISTS, in church hiſtory, a Chriſtian ſect in Holland. They are a kind of anabaptiſts; but they have ſome very particular opinions. They reject the uſe of churches, of the ſacraments, public prayer, and all other external acts of worſhip. They aſſert, that all the Chriſtian churches of the world have degenerated from the pure apoſtolical doctrines, becauſe they have ſuffered the word of God, which is infallible, to be expounded, or rather corrupted, by doctors, who are not infallible. They lead a very auſtere life, and employ a great part of their goods in alms.

BOS, the ox, in zoology, a genus of quadrupeds, of the order of the pecora, the characters of which are, that the horns are hollow and turned forward, bent like creſcents, and ſmooth on the ſurface.

Of this genus, authors enumerate the five following ſpecies, viz. 1. The common tame kind. 2. The bonaſus. 3. The biſon. 4. The bubalus. 5. The urus.

BOSCAGE, the ſame with a grove, or thicket.

BOSCAGE, in a law ſenſe, is that food which trees yield to cattle, as maſt, &c. But Manwood ſays, to be quit of boſcage, is to be diſcharged of paying any duty for wind-fall wood in the foreſt.

BOSCAGE, among painters, denotes a landſchape repreſenting much wood and trees.

BOSEA, in botany, a genus of pentandrious plants, whoſe flower is apetalous; the fruit is a globoſe berry of one cell, containing a ſingle roundiſh acuminated ſeed.

BOSPHORUS, in geography, is a long, narrow ſea, running in between two lands, by which two continents are ſeparated, and by which way a gulf and a ſea, or two ſeas, have a communication one with the other; as the Thracian Boſphorus, now called the Streights of Conſtantinople.

BOSQUETS, in gardening, groves ſo called, from *boſchetto*, an Italian word, which ſignifies a little wood; they are compartments in gardens formed by the branches of trees, diſpoſed either regularly in rows, or wildly and irregular, according to the fancy of the owner. A boſquet is either incloſed with paliſadoes, or hedges of lime, elm, hornbeam, or beech, which ſhould be kept well ſheared, and not ſuffered to riſe too much, that the heads of the trees may be fully ſeen over them, and the ſtems only hid from the ſight. The ground ſhould be kept ſmooth, or elſe covered with graſs. In planting boſquets, care ſhould be taken to mix the trees which produce their leaves of a different ſhape, and various ſhades of green, hoary, and mealy leaves, ſo as to afford an agreeable proſpect; but it is improper to mix evergreens with deciduous trees, for beſides the ill effect it hath to the ſight (eſpecially in winter) they ſeldom thrive well together. Boſquets are only proper for ſpacious

gardens, and require a great expence in their firſt making, as alſo in keeping them up.

BOSSAGE, in architecture, a term uſed for any ſtone that has a projecture, and is laid rough in a building, to be afterwards carved into mouldings, capitals, coats of arms, &c.

Bossage is alſo that which is otherwiſe called ruſtic work, and conſiſts of ſtones which advance beyond the naked, or level, of the building, by reaſon of indentures or channels left in the joinings. Theſe are chiefly uſed in the corners of edifices, and thence called ruſtic quoins. The cavities or indentures are ſometimes round, ſometimes chain-framed, or bevelled, ſometimes in a diamond form, and ſometimes incloſed with a cavetto, and ſometimes with a liſtel.

BOSTANGIS, in the Turkiſh affairs, perſons employed in the garden of the ſeraglio, out of whoſe number are collected thoſe who are to row in the grand ſeignior's barges, when he has a mind to divert himſelf with fiſhing, or take the air upon the canal. They who row on the left hand are only capable of mean employments in the gardens; but they who row on the right-hand may be promoted to the charge of boſtangi-bachi, who has the general intendancy over all the grand ſeignior's gardens, and commands above ten thouſand boſtangis.

BOTALE Foramen, in anatomy, a name given to the foramen ovale, from Botall, phyſician to Charles IX. to whom the diſcovery of it is aſcribed. See the articles Heart and Foramen Ovale.

BOTANIST, a perſon ſkilled in botany, and conſequently, by ſyſtematic rules, capable of aſſigning to every plant its proper characters and name.

BOTANY, the ſcience which treats of plants, their ſeveral kinds, their forms, virtues, and uſes. The word is Greek, βοτανη, an herb, which is derived from βοω, to feed; becauſe moſt animals feed on vegetables.

Botaniſts divide the vegetable world into genera and ſpecies, though they have not all agreed from what conſideration. Tournefort, a late and good writer on botany, after a long and accurate diſcuſſion, choſe, in imitation of Geſner and Columna, to claſs and regulate plants by the flowers and fruit, conſidered together; ſo that all plants which bear a reſemblance in thoſe two reſpects, are of the ſame genus; i. e. that they all agree in ſome one common character, in reſpect of the ſtructure of certain parts, whereby they are diſtinguiſhed from all other plants which are of the ſame family; after which, the reſpective differences as to root, ſtem, and leaves, makes the different ſpecies or ſubdiviſions. He aſſerts, that he never hitherto met but with twenty-two different figures of flowers, which are to regulate entirely the genus or claſs of plants; and which is all that is to be retained in the memory, to be capable to deſcend to near ſeven hundred genera, comprehending upwards of two thouſand ſpecies of plants. According, therefore, to Tournefort's ſyſtem of botany, all plants are ranged under one or other of the following claſſes; 1. Plants with monopetalous, campaniform, or bell-ſhaped flowers. 2. Thoſe with monopetalous, infundibuliform, or funnel-ſhaped flowers. 3. Plants with anomalous monopetalous flowers. 4. Plants with polypetalous labiated flowers. 5. Plants with polypetalous cruciform flowers. 6. Plants with polypetalous roſaceous flowers. 7. Plants with polypetalous, roſaceous, and umbellated flowers. 8. Plants with caryophillous, or pink-like flowers. 9. Plants with liliaceous, or lily-like flowers. 10. Plants with polypetalous papilionaceous flowers. 11. Plants with polypetalous anomalous flowers. 12. Plants with floſculous flowers. 13. Plants with ſemifloſculous flowers. 14 Plants with radiated flowers. 15. Plants with ſtamineous flowers. 16. Plants without flowers, but having viſible ſeeds. 17. Plants with neither viſible flowers nor ſeeds. 18. Trees with apetalous flowers. 19. Trees with apetalous amentaceous flowers. 20. Trees with monopetalous flowers. 21. Trees with roſaceous flowers. 22. Trees with papilionaceous flowers: the deſcription of each ſee under their reſpective articles, Monopetalous, Campaniform, &c. See alſo plate XXI. *fig.* 2. and Tournefort's *Syſtem.*

This ſyſtem was generally approved of till lately; when Dr. Linnæus, profeſſor of botany and medicine at the univerſity of Upſal in Sweden, founded a new ſyſtem called the Sexual, on a diſcovery that there is in vegetables, as well as in animals, a diſtinction of the ſexes. This was not wholly unknown to the ancients, but their knowledge of it was very imperfect; for tho' the generality of vegetables produce hermaphrodite flowers, containing within them the characters of both ſexes; yet in the claſſes of monoecia and dioecia, the ſexes are parted and allotted to different flowers; and particularly in the claſs dioecia, the ſexes are even on different plants, the male growing on one hand, the female flowers on the other. Now this laſt circumſtance the antients had obſerved: indeed, it could hardly eſcape their notice; for the palm-tree, whoſe fruit was in eſteem, being of the claſs dioecia, a very little obſervation was requiſite to teach them, that in theſe trees the flowers of the male were neceſſary to ripen the fruit of the female. Accordingly we find, in the account given by Herodotus, (in his firſt book) of the country about Babylon, where the trees were in plenty, that it was a cuſtom with the natives, in the culture of this plant, to aſſiſt the operations of nature, by gathering the flowers of the male-trees, and carrying them to the female: by this means they ſecured the ripening of the fruit, which might elſe, from

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J. Lodge Sculp.

unfavourable ſeaſons, or the want of a proper intermixture of the trees of each ſex, have proved precarious, or at leaſt, not to have been expected in equal quantities. It ſeems ſomewhat extraordinary that this diſcovery ſhould not have led the antients to develope the whole proceſs of nature in the propagation of the various ſpecies of vegetables; and yet it does not appear, by any of their writings that are handed down to us, that they went farther than this obvious remark upon the palm-tree, and ſome ſimilar notions concerning the fig. They had indeed, from what they ſaw in theſe plants, formed a notion that all others were male and female likewiſe; but this notion was falſe, the far greater part having hermaphrodite flowers; and ſerves to convince us, that what they diſcovered of the palm or fig, was only a right gueſs, and not founded on any knowledge of the anatomy of flowers, either in thoſe trees or any others.

In this dark ſtate, the doctrine of the ſexes of vegetables remained not only through all the ages of antiquity, but almoſt to the end of the laſt century; the moderns ſeeing no more of this doctrine than the antients had done before them; and hence we have to this hour in uſe the falſe diſtinctions of male and female ſpecies of cornus, peony, ciſtus, and many others, which have all hermaphrodite flowers, the diſtinction, in theſe caſes, being grounded on nothing more than ſome difference in the habit of the two ſpecies, with which the ſexes are no ways concerned. The honour of having firſt ſuggeſted the true ſexual diſtinctions in plants, appears to be due to our own countryman Sir Thomas Millington, from whoſe hints Dr Grew, as the doctor himſelf acknowledges, was led to the obſervations he has given on this ſubject in his Anatomy of Plants, p. 171. After this, Camerarius, Moreland, Geoffroi, Vaillant, Blair, Juſſieu, and Bradley, purſued their enquiries and experiments ſo far as to remove all doubt concerning theſe diſcoveries; and laſtly, Linnæus founded thereon a new ſyſtem of botany, which we will explain from the *Ratio Operis*, affixed to his *Genera Plantarum*, printed anno 1764. This celebrated botaniſt ſays, "Whatever knowlege we are able to acquire of things, depends on a true method of arranging them, by which we diſtinguiſh their ſimilitudes and differences; the more natural diſtinctions ſuch method comprehends, the clearer are our ideas of objects; the more things our conceptions are employed upon, the greater is the difficulty, and, indeed, the neceſſity of methodizing them. Our great Creator has no where afforded the ſenſes of mankind ſo many objects of contemplation as in the vegetable kingdom, which covers and fills the whole of that globe we inhabit; if a true method therefore is any where of conſequence, it certainly muſt be here, if we hope to acquire a clear notion of vegetables. This made Cæſalpine ſay, 'that 'unleſs plants, like an army encamped, were re-'duced into orders and claſſes, there could be no-'thing but confuſion and uncertainty.' He underſtands vegetables who knows how to join ſuch as reſemble each other, and to ſeparate thoſe that do not. He is a botaniſt who can give like names unto like, and diſtinct names to diſtinct vegetables, ſo as any perſon may underſtand them. The names of plants are according to their genus, and alſo, where there are many ſpecies, ſpecific; and ought to be certain and fixed, not vague, mutable, or ſuch as may be variouſly applied. Now in order to make them ſuch, they muſt be aſcribed to determined, not uncertain, ſigns; for where the latter are vague and indiſtinct, their names muſt be ſo likewiſe, and conſequently, the ideas of the botaniſt confuſed.

"There are as many ſpecies as Infinite Being has produced diverſified and regular forms in the globe; which forms, according to the conſtant laws of generation, produce more in their own likeneſs: there are, therefore, as many ſpecies as there are at this day different forms or ſtructures of plants, taking no notice of ſuch little varieties which place or chance now and then exhibit. There are as many genera as there are common and relative attributes belonging to the different ſpecies at firſt created; revelation, diſcoveries, and obſervation, confirm this: hence all genera are natural. The limits therefore of each genus are to be cloſely and diligently obſerved, however great or difficult the taſk; for, as Cæſalpine ſays, 'when the genera 'are confounded, every thing elſe muſt be ſo too.'

"That it pleaſed Infinite Wiſdom to diſtinguiſh the genera of plants from their fructification, was the diſcovery of the laſt age; and of Conradus Geſner firſt of all, the ornament of his time, as is evident from his poſthumous letters. publiſhed from the originals by Camerarius; but the firſt who brought this diſcovery into uſe was Andrew Cæſalpinus, which yet would ſoon have expired, had it not been revived by the care of Robert Morriſon, and cultivated by Pitt and Tournefort, according to clear and ſyſtematic rules, and laſtly, fully eſtabliſhed by all who have ſince approved themſelves maſters in the art.

"This foundation being ſettled, perſons qualified for labours of this kind began to avail themſelves thereof, and raiſe thereon their ſeveral ſyſtems, all indeed with the ſame alacrity, and for the ſame end, but with very unequal ſucceſs; to few only was the fundamental principle rightly underſtood. He who propoſes to teach an art muſt deſcend from generals to particulars; on the contrary, the inventer muſt aſcend from particulars to generals. Different writers have laid down different parts of fructification for a leading principle, from whence they deſcended, according to the uſual method of diviſion, from claſſes firſt to orders, till they came

to ſpecies, and thus with hypothetic and arbitrary principles, broke and tore in pieces the natural genera, and did a violence to nature. For example, one denies from the fruit, that the peach and almond-tree can be of the ſame genus; another, from the regularity of the petals, denies the ſame with valerian and valerianoides; while a third, from the number of the petals, aſcribes to different genera the flax and olive. Another, from the ſex, denies, that the linum and radiola, the hermaphrodite nettle and dioica, &c. can poſſibly be united together under the ſame genus; they further ſay, that they cannot even be joined in claſs, much leſs in genus: but the misfortune is, theſe writers do not obſerve, that the claſſes, ſuch as they be, are of their own conſtruction, while the Creator himſelf has formed the genera; and from this error ariſe ſo many erroneous genera, ſo many controverſies among authors, ſo many improper names, and ſo much confuſion, that they have at length really brought things into ſuch a ſituation, that as often as a new ſyſtem-writer ſtarts up, the whole botanical world is alarmed; and to ſpeak the truth, I really am at a loſs to know, whether theſe ſyſtem-writers have done moſt good or harm. This is a misfortune which phyſicians, apothecaries, and gardiners, long lamented, and I muſt own, not without reaſon. Their theory would have been the beſt, if it had pleaſed the great Creator to have produced all the fructifications of the ſame genus equally reſembling each other, as the individuals of the ſame ſpecies do; which not being the caſe, there is nothing left for us to do, but, as we cannot be ourſelves the lords of nature, and cannot create every plant over again according to our own conceptions, to ſubmit ourſelves to the laws of nature, and with a cloſe and vigilant application, accuſtom ourſelves to read the characters inſcribed on plants. If it be granted, that each different mark of fructification is ſufficient to diſtinguiſh the genus, why ſhould we heſitate a moment to pronounce that there are almoſt as many genera as ſpecies? for there are hardly any flowers of the two ſpecies known to us ſo like each other, but there is ſome difference in their parts; therefore, I would adviſe all ſenſible botaniſts to acknowledge, if they would wiſh to obtain any certainty in the art, that all the genera and ſpecies are natural, without which fundamental point we cannot proceed with any degree of certainty. We will ſuppoſe the great Creator of all things, from the beginning, to have created only one ſpecies of each genus; we will alſo ſuppoſe theſe firſt ſpecies afterwards, either in the beginning or proceſs of time, to have been fecundated by ſpecies of other genera; from thence it would follow, that new ſpecies would ariſe, while theſe, in ſome meaſure, would, in the form of the flower, reſemble the female, but the plant be like the male." See *Amæn. Acad.* vi. p. 279.

"This poſtulatum being granted, let each proceed according to his own method, and divide theſe genera into orders and claſſes. Cæſalpinus, Herman, Ray, &c. take it from the fruit; Tournefort, from the form of the corolla; Rivinus, from the number and equality of the petals; Magnol, from the calyx or cup; and none of theſe methods are bad; for it is of little ſignification by what method we come at the genera, provided it is an eaſy one. That is to be preferred which leads the ſureſt to it, and is the moſt univerſal; for it is ſcarcely to be believed, there are any perſons born with ſo perfect a memory, as, without a ſyſtem, to retain all the genera; for orders are only ſubaltern claſſes, and none will deny but it is eaſier to diſtinguiſh a few genera, than all: it is an eaſy matter to refer the greateſt part of the known genera to their proper natural claſſes, but it is therefore more difficult with regard to the reſt; nor is it to be expected, that our age will be able to ſee any natural ſyſtem, or hardly our deſcendants, for a long time to come; yet, as we ſtudy to know plants, we muſt, in the mean time, make uſe of artificial and ſuccedaneous claſſes. The natural claſſes would pleaſe every body, provided any one could find out their characters; but to retain theſe without a character comprehending the proper genera, and rejecting others, would be the ſame thing as rejecting every method. The antients, in the time of the Bauhines, ſtuck cloſely to the natural claſſes; but a character was wanting, from their not having rightly diſcovered the parts of fructification, when Tournefort deſcended with the bright light of fructification to the genera, till then obſcure. For example, the melianthus, epimedium, hypocoum, tumaria, impatiens, &c. muſt neceſſarily agree in the natural order; but who will, from any part of the fructification, undertake to give a combining and diſtinguiſhing character? Compoſite flowers comprehend the corymbus with a ſingle flowered cup, the erigeron with four filaments, the kuhnia with diſtinct antheræ, the ſtrumpſia with berried fruit: now who could ever give a character applicable to theſe and not to others? Taking then the natural genera, and treating properly on them, two things are required, viz. That the true ſpecies, and no other, be referred to their genera; and that every particular genera be circumſcribed within its true bounds and limits, which we denominate generical characters.

"In looking over writers, I find none of theſe characters fixed and certain before Tournefort; therefore, to him I ought to aſcribe, not without reaſon, the honour of the invention reſpecting the genera. Other ſyſtematic writers, of different methods, have alſo delivered them; but I underſtand none of them except Tournefort; and thoſe who have

have followed him; as Plumier, Petit, Boerhaave, Vaillant, Dillenius, Ruppius, Pontedera, Buxbaum, Mitchel, and a few others; moſt of whom, although they deviated from the claſſes and orders, or the method of Tournefort, nevertheleſs, were his followers in the genera.

"Tournefort aſſumed the petals and fruit for the diagnoſtic marks of the genera, and no other parts; and his followers, in general, did the ſame: but writers of a later date, overpowered with an abundance of new and lately diſcovered genera, found out that theſe parts alone were inſufficient to diſtinguiſh all the genera; and, on that account, thought themſelves obliged to have recourſe to the look and appearance of the plants; ſuch as, the leaves, the ſituation of the flower, the ſtalk, the root, &c. that is, they deviated from the very fundamental of fructification, and fell into the original barbariſm. However, it muſt be confeſſed, that the parts deſcribed by Tournefort are not ſufficient; for if only the petals and fruits are to be taken account of, I will deny the whole myſtery of fructification: but I would aſk, Whether reaſon ever told us that the marks are to be drawn from theſe alone? What revelation, or what arguments drawn a priori, or a poſteriori? Certainly none. Does there not plainly appear many more parts in fructification? Why are ſome to be taken notice of, and others neglected? Were they not all created alike by the ſame hand? Are they not all neceſſary parts? We can diſcern in the calyx, 1. The involucrum; 2. The ſpatha; 3. The perianthium; 4. The amentum; 5. The glume; 6. The calyptra. In the corolla, 7. The tube or claws; 8. The border; 9. The nectarium. In the ſtamina, 10. The filaments; 11. The antheræ. In the piſtillum, 12. The germen; 13. The ſtyle; 14. The ſtigma. In the pericarpium, 15. The capſule; 16. The pod; 17. The legumen; 18. The nut; 19. The drupe; 20. The berry; 21. The apple. In the ſeed, 22, 23. its corona. In the receptacle, 24. Of its fructification; 25. Of the flower; 26. The fruit. Here are more parts, more characters, than in the alphabets of languages; all theſe marks ſerve us as ſo many letters of vegetables, in reading of which we learn the characters of plants: they were wrote by their Maker, and it is our buſineſs to read them.

"Tournefort, with his characters, did wonders; but as there are ſince ſo many new genera diſcovered, I ſhall adhere to his principles, but ſhall enlarge them with new diſcoveries, as the ſcience encreaſes.

"I do not approve of drawings alone in determining the genera. Before the uſe of letters, it was neceſſary to expreſs things by picturesque repreſentations, where it could not be done by words; but, by the invention of letters, we have a more certain and eaſy method of communicating our ideas: ſo it is in botany, before the diſcovery of letters, theſe figures were of the greateſt utility, but theſe have afforded a much ſhorter way.

"Characters of the genera are obtained in a threefold manner, factitious, eſſential, and natural. Factitious characters has fixed a ſingle mark on the genus, by which it diſtinguiſhes one from the reſt belonging to the ſame order, but not from others. A character of this ſort may be eaſily underſtood by any one, and is inſtituted by means of ſynoptic tables, as it is delivered by Ray, in the firſt edition of his Synopſis; alſo by Knautius and Kramerus. Certainly, if there were never any doubts raiſed concerning the claſs or order, and all the genera exiſting in nature were diſcovered, this would be the eaſieſt method: but as this neither is, or can be, the caſe, the character is deceptive; for when any new genus is diſcovered, the neareſt characters, and ſuch as ariſe from the branch to which they ſhould be annexed, become fallacious.

"The eſſential character gives the moſt certain mark to the genus it is applied to, and recommends itſelf for its brevity and exactneſs. As for example, in the parnaſſia, nigella, hellebore, ranunculus, &c. it is very readily perceived by the nectarium alone; but it is doubtful, whether this character can be obtained in all the genera; and I would fain ſee the eſſential character in the umbelliferous flowers and others.

"I therefore lay down thoſe for natural characters, which exhibit all the marks of fructification obvious and common. The uſe and prerogatives of natural characters are as follow: one of this kind is applicable to all methods, if the ſyſtem is raiſed on that never-failing foundation, the fructification. Let any one take a method from the calyx, or the corolla, or the ſtamina, or the piſtillum, or the fruit; we ſhall ſtill have the ſame natural character where there is the ſame genus. Formerly, it was neceſſary to compoſe as many characters of all the genera as there were ſyſtems; but in this it is not ſo: if even a thouſand new genera were diſcovered, it would not, on that account, be neceſſary to add or take away a ſingle mark from the neareſt natural genus, as was neceſſary in all the reſt.

"This character, or definition of genus, might be diſtinctly treated of without method, and might be eaſily retained and underſtood in any book. While it ſerved under its proper claſs, it expreſſes the ſame idea. Were the names changed a thouſand times, you perceive more marks than is neceſſary to diſtinguiſh the ſubject genus by from others; theſe are a proof that you have a true genus, and no other: whether any of theſe marks would be ſuperfluous if all the genera were diſcovered, time only can determine.

"In deſcribing the different parts of fructification, I have ſelected ſuch marks as are certain and

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real, not vague and loose. Some have assumed the taste, smell, colour, and also the size, without any proportional standard: you will not see me assume these; but the following four certain and fixed mechanical principles only; the number, the figure, the site, and the proportion. These four attributes, with the twenty-six characters before-mentioned, distinguish the genera from each other with so much exactness, that nothing can excel it: considering only these marks, nothing will be wanting to determine the genera, and the other marks will be superfluous; nor is there any occasion to have recourse to the habit or appearance of plants.

"In forming a character of this sort, we must take all the species that are known. The four obvious marks abovementioned are to be well described in all the parts of fructification, and those which do not agree with all the species are to be excluded; and those only which do agree therewith to be retained. As it is impossible for any one person to see all the species, he who sees the most, and observes in them such marks as are not similar, should exclude the same in forming a character, that posterity hereafter may see a complete work."

Having thus given, as far as it seems necessary, the new principles upon which the reformation of the former vicious systems of botany have been undertaken, we come to shew the method introduced by Linnæus.

Vegetables, according to him, are primarily divisible into three parts; 1. The root; 2. The herb, or plant itself; 3. The fructification: and in this order these parts might have been treated, were it not on account of the sexual system; it therefore became necessary to give up the order of the parts of the vegetable, and follow that of the system.

The system is divided, 1. Into classes; 2. orders; 3. genera, 4. species; 5. varieties.

From the number, situation, and proportion of the stamina, this curious botanist has arranged the whole family of plants under twenty-four classes, viz.

1. Monandria. 2. Diandria. 3. Triandria. 4. Tetrandria. 5. Pentandria. 6. Hexandria. 7. Heptandria. 8. Octandria. 9. Enneandria. 10. Decandria. 11. Dodecandria. 12. Icosandria. 13. Polyandria. 14. Didynamia. 15. Tetradynamia. 16. Monadelphia. 17. Diadelphia. 18. Polyadelphia. 19. Syngenesia. 20. Gynandria. 21. Monoecia. 22. Dioecia. 23. Polygamia. 24. Cryptogamia. See them explained under their respective articles. See also LINNÆUS's *System*.

These are the general classes of plants established by that excellent botanist, who farther subdivides them into orders, which he denominates monogynia, digynia, &c. from the number of pistils, or female parts of generation, found in each plant. See the articles MONOGYNIA, DIGYNIA, &c.

For a farther account of the botanical works of this celebrated author, we would refer the curious reader to his *Genera Plantarum*, *Species Plantarum*, *Philosophica Botanica*, and *Amoenitates Acad.* Vol. III. in which last he will find the history of botany divided into four epochas, viz. 1. *Epocha Patrum*; 2. *Fundatorum*; 3. *Systematicorum*; and, 4. *Reformatorum*. He will likewise find the principal works of botanists, both antient and modern, mentioned; and their progress in the science.

BOTE, *Bota*, in our old law books, signifies recompence or amends; thus a man-bote is a compensation for a man slain.

There are likewise house-bote and plough-bote, privileges to tenants, of cutting wood for making ploughs, repairing tenements, and likewise for fewel.

BOTRYS, in botany, a species of the chenopodium. See CHENOPODIUM.

BOTTLE-FLOWER, in botany; see the article CENTAUREA.

BOTTOM, in the marine, is used either to denote the bottom of a ship, or the bottom of the water; thus, in the former sense, we say, a clean or a foul bottom, a British, French, or Dutch bottom; and in the latter sense, a rocky, sandy, or oozy bottom.

BOTTOMRY, in marine commerce, a contract for borrowing money on the keel or bottom of a ship; so that the commander binds the ship herself, that if the money be not paid at the time appointed, the creditor shall have the ship.

BOTTOMRY is also where a person lends money to a merchant or adventurer, who wants it in traffic, and the lender is to be paid a much greater sum at the return of the ship, standing to the hazard of the voyage: on which account, though the interest be greater than the law commonly allows, yet is it not usury, because the money being supplied at the lender's hazard, if the ship perishes, he shares in the loss.

BOTTONY. A cross bottony, in heraldry, terminates at each end in three buds, knots, or buttons, resembling, in some measure, the three-leaved grass; on which account, Segoing, in his Tresor Heraldique, terms it croix trefflee. It is the badge of the order of St. Maurice.

BOULDER-WALL, a kind of wall built of round flints or pebbles, laid in a strong mortar, and used where the sea has a beach cast up, or where there are plenty of flints.

BOULTINE, in architecture, is the workmen's term for a convex moulding, whose convexity is just one fourth of a circle; this is placed next below the plinth in the Tuscan and Doric capital.

BOUNTY, in commerce, a premium paid by the government to the exporters of certain British commodities, as sail-cloth, gold and silver lace, silk stockings, fish, corn, &c.

BOUR-

BOURDONEE, in heraldry, the ſame with pomee. See the article POMEE.

BOURIGNONISTS, the name of a ſect among the Low-Country proteſtants, being ſuch as follow the doctrine of Antoinette Bourignon, a native of Liſle, and apoſtate of the Roman catholic religion.

The principles of this ſect bear a very near reſemblance with thoſe of the quietiſts, quakers, or fanatics. They conduct themſelves by pretended revelations.

BOUTANT, or ARCH-BOUTANT, in architecture, a flat arch or part of an arch, abutting againſt the reins of a vault, to prevent its giving way.

A Pillar BOUTANT is a large chain or pile of ſtone, made to ſupport a wall, terrace, or vault.

BOUTS-RIMEZ, in French poetry, a term ſignifying certain rhymes diſpoſed in order, and given to a poet, together with a ſubject, to be filled up with verſes ending in the ſame word and ſame order. In chooſing the rhymes, it is uſual to fix on ſuch as ſeem the remoteſt, and have the leaſt connection. Some authors fancy, that theſe rhymes are, of all others, the eaſieſt; that they aſſiſt the invention, and furniſh new thoughts.

BOW, *Arcus*, a weapon of offence made of ſteel, wood, horn, or other elaſtic matter, which, after being bent by means of a ſtring faſtened to its two ends, in returning to its natural ſtate, throws out an arrow with prodigious force.

BOW, a mathematical inſtrument uſed formerly at ſea, for taking the ſun's altitude. It conſiſted of an arch containing ninety degrees, a ſtaff, a ſhade-vane, a ſight-vane, and an horizon-vane.

BOW, in naval architecture, the rounding part of a ſhip's ſide forward, beginning at where the planks arch inwards, and terminated where they cloſe at the prow or ſtem: it is proved by experience, that a ſhip with a narrow bow is much better calculated for ſwiftneſs of ſailing, than one with a broad bow, but not ſo well for a high ſea, into which ſhe always plunges or pitches her fore part very deep, for the want of ſufficient breadth to repel the volume of water, which ſhe ſo eaſily divides in her fall.

The former of theſe is called by ſeamen a lean, and the latter a bluff-bow.

On the BOW, in navigation, an arch of the horizon comprehended between the point of the compaſs which is right a-head, or to which a ſhip's ſtem is directed, and ſome object ſeen or diſcovered by trigonometry; as, We ſaw a fleet to the windward, three points on the bow; that is, three points from that part of the horizon which the ſhip ſtems. Alſo having found the diſtance of any place by calculation, it is occaſionally ſaid to be *on the* BOW.

When a ſhip ſails with a ſide-wind, the bow next to the wind is called the weather-bow, and the other the lee-bow; any object diſtant from the latter is not ſaid to be *on*, but *under* the lee-bow.

BOW, among builders, is a beam of wood or braſs, with three long ſcrews that govern or bend a lath of wood or ſteel to any arch, and is of uſe for drawing arches that have large radii, &c. which cannot be ſtruck with compaſſes.

BOW, in muſic, a ſmall machine, which, being drawn over the ſtrings of a muſical inſtrument, makes it reſound. It is compoſed of a ſmall ſtick, to which are faſtened eighty or an hundred horſe-hairs, and a ſcrew, which ſerves to give theſe hairs the proper tenſion. In order that the bow may touch the ſtrings briſkly, it is uſual to rub the hairs with roſin.

BOW, among artificers, an inſtrument ſo called from its figure; in uſe among gunſmiths, lock-ſmiths, watchmakers, &c. for making a drill go. Among turners, it is the name of that pole fixed to the cieling, to which they faſten the cord that whirls round the piece to be turned.

BOWS *of a Saddle* are two pieces of wood laid archwiſe to receive the upper-part of a horſe's back, to give the ſaddle its due form, and to keep it tight.

BOWER, in gardening, a place under the cover of trees; it differs from an arbour by its form, it being generally of a round or ſquare ſhape, whereas arbors are built long and arched.

BOWLINE, in the marine, a rope faſtened to the leech or perpendicular edge of the ſquare-ſails, in three or four parts called briſtles; they are only uſed on the weather-ſide, or the ſide of the ſail next the wind, to keep that part of it tight forward, and prevent it from ſhivering, which would always be the caſe, as the ſhip ſails on a ſcant ſide-wind. See this more particularly explained under the articles BRIDLE and CLOSE-HAWLING.

BOWLING-GREEN, in gardening, a kind of lawn, laid with fine turf, and deſigned for the exerciſe of bowling. Bowling-greens are generally of a ſquare form, and ſhould be made nearly level, particularly the ſides, the middle being rather the higheſt.

BOWSING, in the marine, drawing on any body with the powers of a taicle; or uſing a taicle in a method where it does not ſuſpend the body drawn upon, which is then called hoiſting.

BOWSPRIT, in naval affairs, a large boom or maſt which projects over the ſtem, to carry ſail on, and govern the fore-part of the ſhip to counterballance the ſail carried behind, or in the afterparts; and likewiſe to ſupport the fore-maſt, by ropes ſtretched from the maſt-head to the outer-end of the bowſprit, called ſtays. See BOOM and STAYS.

BOX, in its moſt common acceptation, denotes a ſmall cheſt or coffer for holding things.

Box *of a Plough*, the croſs piece in the head of a plough, which ſupports the two crow-ſtaves. See PLOUGH.

BOX, in zoology, the ſame with boops. See the article BOOPS.

BOX-TREE, in botany; ſee the article BUXUS.

BOX-THORN, in botany; ſee the article LYCIUM.

BOX-HAWLING, or VAUX-HAWLING, in navigation; ſee the article HAWLING.

BOXING, in navigation, arranging the head-ſails of a ſhip aback, when, by the neglect of the ſteerſman, ſhe had made ſome declination from the line of her courſe, and had inclined her motion nearer to the direction of the wind, than the ſails would ſtand full ſide-ways. See ABACK.

The uſe of boxing at that time is to act with greater impulſe on the ſhip's fore-part than uſual, till the force impreſſed compels her to change her poſition, veer farther from the courſe of the wind, and return into the line of motion from which ſhe had deviated.

BOYAU, in fortification, is a particular ditch ſeparated from the main trench, which in winding about encloſes different ſpaces of ground, and runs parallel with the works and fences of the body of the place; ſo that when two attacks are made at once, near one to the other, the boyau makes a communication between the trenches, and ſerves as a line of contravallation, not only to hinder the ſallies of the beſieged, but alſo to ſecure the miners. But when it is a particular cut that runs from the trenches to cover ſome ſpot of ground, it is then drawn parallel to the works of the place, that it may not be enfiladed, or that the ſhot from the town may not ſcour it.

BOYES, idolatrous prieſts among the ſavages of Florida.

Every prieſt attends a particular idol, and the natives addreſs themſelves to the prieſt of that idol to which they intend to pay their devotion.

The idol is invoked in hymns, and his uſual offering is the ſmoke of tobacco.

BOYLE's LECTURES, a courſe of ſermons ſet on foot, in London, by the honourable Robert Boyle in 1691; the deſign of which is to prove the truth of the Chriſtian religion againſt infidels, without deſcending to any controverſies among Chriſtians.

BRABEUTES, or BRABEUTA, βραβευτης, in antiquity, an officer among the Greeks, who preſided at the public games, and decided controverſies that happened among the antagoniſts in the gymnical exerciſes. The number of brabeutæ was not fixed; ſometimes there was only one, but more commonly they amounted to nine or ten.

BRABEJUM, the African almond, in botany, a tetrandrious plant, which riſes with an upright ſoft ſtem, full of pith within, and covered with a brown bark; from the ſtem iſſues forth ſeveral horizontal branches on every ſide, and at every joint, the lower ones being the longeſt, and every tier diminiſhing to the top, ſo as to form a kind of pyramid. The leaves come out all round the branches at each joint, which are from four to five inches long, and half an inch broad at the middle: theſe are of a deep-green on their upper-ſide, and pale underneath, indented on their edges, and ſtanding on very ſhort foot-ſtalks. The flowers are produced toward the end of the ſhoots, and come out from between the leaves quite round the branches; theſe are of a pale colour, inclining to white, and are compoſed of four narrow obtuſe petals, in the lower part erect, forming a kind of tube, and in the upper turned backward. In the bottom of the petals are inſerted four capillary filaments, topped with ſmall antheræ; in the center is placed a ſmall villoſe germen, which afterwards becomes a hairy drupe, of the drier kind, of an oval figure, containing a kernel of the ſame ſhape.

This plant is a native of the country about the Cape of Good-Hope; and in this climate muſt be ſheltered in a green-houſe in winter.

BRACE is commonly taken for a couple or pair, and applied by huntſmen to ſeveral beaſts of game, as a brace of bucks, foxes, hares, &c.

BRACE, or BRASSE, is alſo a foreign meaſure, anſwering to our fathom. See FATHOM.

BRACE, in architecture, is a piece of timber framed in with bevel-joints, and is uſed to keel the building from ſwerving either way. It is called a ſtrut, when it is framed into the kindleſſes and principal rafters.

BRACES, in the marine, the ropes faſtened to all the yard-arms or yard-ends in a ſhip, except the mizen-yard: their uſe is to wheel or traverſe the ſail-yards about the maſts, in a direction parallel to the horizon, as the ſails are to be ſhifted to the variation of the wind.

BRACED, in heraldry, a term for the intermingling three cheoronels.

BRACELET, an ornament worn on the wriſt, much uſed among the ancients. It was made of different materials, and in different faſhions, according to the age and quality of the wearer.

BRACHIÆUS, in anatomy, an oblong, thick, and broad muſcle, lying immediately on the anterior part of the lower half of the os humeri. The upper part of it is forked or ſloped, and at the bending of the joint of the elbow, the lower part contracts.

It is fixed to the ſurface of the os humeri by a great number of fleſhy fibres, from the lower inſertion of the deltoides, almoſt down to the two foſſæ at the lower extremity of the bone, and from one edge of the fore ſide of this lower extremity to the other. The fibres are for the moſt part longitudinal, thoſe neareſt the ſurface of the muſcle being

ing longeſt, the more internal growing gradually ſhorter.

The lateral fibres are a little oblique, and this obliquity increaſes in thoſe that lie loweſt. Theſe lateral fibres are partly fixed in the intermuſcular ligaments of the os humeri, of which ligaments, that which lies toward the internal condyle is longer and broader than that toward the external condyle. The loweſt of theſe fibres are very oblique, and form on each ſide a kind of ſmall ſeparate faſciculus.

In paſſing over the joint, all theſe fibres contract in breadth, and afterwards end in a ſtrong flat tendon inſerted in the muſcular impreſſion, which is directly below the coronoide apophyſis of the ulna. This muſcle adheres very ſtrongly to the capſular ligament, and ſome of its fleſhy fibres terminate therein.

The ſloped or forked ſuperior extremity of this muſcle embraces the large tendon of the deltoides. The internal point of the fork meets the inferior inſertion of the coraco-brachialis; and the foreſide of the whole muſcle is covered by the two fleſhy bodies of the biceps.

BRACHIUM, Arm, in anatomy, one of the ſuperior extremities of the human body, comprehending the ſcapula, the os humeri, the cubit, and the hand. See the articles Scapula, Arm, &c.

BRACHMANS, a ſect of Indian philoſophers, known to the ancient Greeks by the name of Gymnoſophiſts. The ancient Brachmans lived upon herbs and pulſe, and abſtained from every thing that had life in it. They lived in ſolitude, without matrimony, and without property; and they wiſhed ardently for death, conſidering life only as a burden. The modern Brachmans make up one of the caſts or tribes of the Banians. They are the prieſts of that people, and perform their office of praying and reading the law with ſeveral mimical geſtures, and a kind of quavering voice. They believe that, in the beginning, nothing but God and the water exiſted; and that the Supreme Being, deſirous to create the world, cauſed the leaf of a tree, in the ſhape of a child playing with its great toe in its mouth, to float on the water: from its navel there iſſued out a flower, whence Brama drew his original, who was intruſted by God with the creation of the world, and preſides over it with an abſolute ſway. They make no diſtinction between the ſouls of men and brutes, but ſay the dignity of the human ſoul conſiſts in being placed in a better body, and having more room to diſplay its faculties. They allow of rewards and puniſhments after this life; and have ſo great a veneration for cows, that they look on themſelves as bleſſed if they can but die with the tail of one of them in their hand. They have preſerved ſome noble fragments of the knowledge of the ancient Brachmans. They are ſkilful arithmeticians, and calculate, with great exactneſs, eclipſes of the ſun and moon. They are remarkable for their religious auſterities. One of them has been known to make a vow, to wear about his neck a heavy collar of iron for a conſiderable time: another to chain himſelf by the foot to a tree, with a firm reſolution to die in that place; and another to walk in wooden ſhoes ſtuck full of nails on the inſide. Their divine worſhip conſiſts chiefly of proceſſions, made in honour of their deities. They have a college at Banara, a city ſeated on the Ganges.

BRACHYGRAPHY, the art of ſhort-hand writing.

The word is compounded of the Greek βραχυς, ſhort, and γραφω, to write.

BRACKET, among carpenters, &c. a kind of wooden ſtay, ſerving to ſupport ſhelves, and the like.

Brackets, in naval architecture, ſhort crooked timbers, ſomewhat reſembling knees: they are fixed under the frame of a ſhip's-head, to ſupport the gratings.

Brackets, in gunnery, are the cheeks of the carriage of a mortar: they are made of ſtrong planks of wood, nearly of a ſemi-circular figure, and bound round with thick iron plates, which are fixed to the bed by four bolts, riſing up on each ſide the mortar, ſerving to keep her at any elevation, by means of ſome ſtrong iron bolts, which go through theſe cheeks or brackets.

BRACTEA, in natural hiſtory, denotes a ſpangle, or thin flake of any ſubſtance.

Bractea, in botany, denotes the floral leaf. See the article Floral Leaf.

BRACTEARIA, in natural hiſtory, a genus of talcs, compoſed of ſmall plates in form of ſpangles, each plate being either very thin, or diviſible into very thin ones.

BRADS, among artificers, a kind of nails uſed in building, which have no ſpreading heads, as other nails have. They are diſtinguiſhed, by ironmongers, by ſix names, as joiners-brads, flooring-brads, batten-brads, bill-brads, or quarter-heads, &c. Joiners brads are for hard wainſcot; batten-brads for ſoft wainſcot; bill-brads are uſed when a floor is laid in haſte, or for ſhallow joiſts ſubject to warp. See the article Nail.

BRADYPUS, in zoology, a genus of quadrupeds, of the order of the anthropomorpha of Linnæus, otherwiſe called *ignavus*, and in Engliſh, the ſloath; the characters of which are, that its feet have no great toe, and are made for climbing. See the article Anthropomorpha.

Of this genus there are two ſpecies. 1. The American ſloath, with a ſhort tail, and only three toes on each foot. 2. The Ceylon ſloath, with only two toes on each foot, and no tail.

BRAGGET, a kind of drink made of malt, honey, and ſpices, much uſed in Wales.

BRAILS, in the marine, ropes faſtened in different places on the hinder, or after-ridge of the mizen, to gather it up to the maſt in order for furling, when it is not required to be uſed.

BRAILS are likewiſe a general name given to all the ropes which haul up, or collect to their yards, the bottoms, edges, and lower-corners of the other great ſails, for the more ready furling them: and this drawing together is called brailing them up, or hauling them up in the brails. Plate XXII. *fig.* 1. in the lower part repreſents ſome part of the ſail B, hauled up in the brails.

BRAIN, in anatomy, a name given to all that maſs which fills the cavity of the cranium, and which is immediately ſurrounded by two membranes, called meninges by the Greeks, and matres by other ancients, becauſe they were commonly of opinion that theſe membranes were the origin, and, as it were, the mother of all the other membranes of the body.

This general maſs is divided into three particular portions; the cerebrum, or brain, properly ſo called; the cerebellum, and medulla oblongata. To theſe three parts contained within the cranium, a fourth is added, which fills the great canal of the ſpina dorſi by the name of medulla ſpinalis, being a continuation of the medulla oblongata.

The meninges, or membranes, are two in number, one of which is very ſtrong, and lies contiguous to the cranium; the other is very thin, and immediately touches the brain. The firſt is named dura mater; the ſecond pia mater, which is again divided into two, the external lamina being termed arachnoides, and the internal retaining the common name of pia mater. See the articles *Dura* MATER and *Pia* MATER.

The cerebrum, properly ſo called, is a kind of medullary maſs, of a moderate conſiſtence, and of a greyiſh colour on the outer ſurface, filling all the ſuperior portion of the cavity of the cranium, or that portion which lies above the tranſverſe ſeptum. The upper part of the cerebrum is of an oval figure, like half an egg cut lengthwiſe, or rather like two quarters of an egg cut lengthwiſe, and parted a little from each other. It is flatter on the lower part, each lateral half of which is divided into three eminences, called lobes, one anterior, one middle, and one poſterior.

The ſubſtance of the cerebrum is of two kinds, diſtinguiſhed by two different colours; one part of it, which is the ſofter, being of a greyiſh or aſh-colour; the other, which is more ſolid, very white. The aſh-coloured ſubſtance lies chiefly on the outer part of the cerebrum, like a kind of cortex; from whence it has been named ſubſtantia corticalis or cinerea. The white ſubſtance occupies the inner part, and is named ſubſtantia medullaris, or ſimply ſubſtantia alba.

The cerebrum is divided into two lateral portions, ſeparated by the falx, or great longitudinal ſeptum of the dura mater. They are generally termed hemiſpheres; but they are more like quarters of an oblong ſpheroid. Each of theſe portions is divided into two extremities, one anterior, and one poſterior, which are termed the lobes of the cerebrum, between which there is a large inferior protuberance which goes by the ſame name; ſo that in each hemiſphere there are three lobes, one anterior, one middle, and one poſterior.

The anterior lobes lie upon thoſe parts of the os frontis which contribute to the formation of the orbits and of the frontal ſinuſes, commonly called the anterior foſſæ of the baſis cranii. The poſterior lobes lie on the tranſverſe ſeptum; and the middle lobes in the middle or lateral foſſæ of the baſis cranii.

Each lateral portion of the cerebrum has three ſides, one ſuperior, which is convex; one inferior, which is uneven; and one lateral, which is flat; and turned to the falx. Through the whole ſurface of theſe three ſides we ſee inequalities or windings like the circumvolutions of the inteſtines, formed by waving ſtreaks or furrows very deep and narrow, into which the ſepta, or duplicatures of the pia mater, inſinuate themſelves, and thereby ſeparate theſe circumvolutions from each other.

Near the ſurface of the cerebrum, theſe circumvolutions are at ſome diſtance from each other, repreſenting ſerpentine ridges; and in the interſtices between them, the ſuperficial veins of the cerebrum are lodged, between the two laminæ of the pia mater, by an infinite number of very fine vaſcular filaments, as may be ſeen by pulling the circumvolutions a little aſunder with the fingers.

When they are cut tranſverſly, we obſerve that the ſubſtantia alba lies in the middle of each circumvolution; ſo that there is the ſame number of internal medullary circumvolutions as of external cortical ones; the firſt repreſenting white laminæ inveſted by others of an aſh-colour; but the cortical ſubſtance is in many places thicker than the medullary.

The anterior and middle lobes of the cerebrum on each ſide are parted by a deep narrow ſulcus, which aſcends obliquely backward, from the temporal ala of the os ſphenoides to near the middle of the os parietale; and the two ſides of this diviſion have each their particular ridges and circumvolutions, which gives a very great extent to the cortical ſubſtance. This ſulcus is termed fiſſura magna ſilvii, or ſimply fiſſura cerebri.

The corpus calloſum is a white convex body, being a middle portion of the medullary ſubſtance, whoſe ſurface is covered by the pia mater. Along the middle of its ſurface, from one end to another, there is a kind of raphae formed by a particular intertexture of fibres, which

croſs each other. After its uniting with the cortical ſubſtance, a medullary arch or vault of an oval figure is formed.

Under this arch are two lateral and ſhallow cavities, ſeparated by a tranſparent medullary ſeptum; and generally called the anterior ſuperior ventricles of the cerebrum.

The above tranſparent partition is generally called the ſeptum lucidum, and lies directly under the raphe or ſuture of the corpus calloſum, of which it is a continuation.

The ſeptum lucidum is united by its lower part to the anterior portion of that medullary body improperly called the fornix, with three pillars; becauſe it is thought to bear ſome reſemblance to the arches of ancient vaults.

The fornix being cut off and inverted, or quite removed, we firſt perceive a vaſcular web, called plexus choroides, and ſeveral eminences more or leſs covered by the expanſion of that plexus. There are four pairs of eminences, which follow each other very regularly, two large and two ſmall. The firſt pair of larger eminences are named corporal ſtriata, from their having a great number of white and aſh-coloured ſtreaks alternately diſpoſed thro' their ſubſtance; and the ſecond pair, thalami nervorum opticorum, becauſe theſe nerves ariſe chiefly from them. The four ſmall eminences are cloſely united together, the anterior being called nates, and the poſterior teſtes; though it would be better to call them ſimply, anterior and poſterior tubercles.

Immediately before theſe tubercles, there is a ſingle eminence called glandula pinealis, a ſmall, ſoft, greyiſh body, about the ſize of an ordinary pea, irregularly round, and ſometimes of the figure of a pine apple. This gland, which Des Cartes will have to be the ſeat of the ſoul, has been often found to contain gravel.

Between the baſis of the anterior pillar of the fornix, and the anterior part of the union of the optic thalami, lies a cavity or foſſula, called infundibulum. It runs down towards the baſis of the cerebrum, contracting gradually, and terminates by a membraneous canal in a ſoftiſh body, ſituated in the ſella ſphenoidalis, named glandula pituitaria. The infundibulum opens above, immediately before the optic thalami, by an oval hole, called foramen commune anterius, and conſequently communicates with the lateral ventricles.

The cerebellum is contained under the tranſverſe ſeptum of the dura mater. It is broader laterally than on the fore or back-ſides, flatted on the upper-ſide, and gently inclined both ways, anſwerable to the ſeptum, which ſerves it as a kind of tent or ceiling. On the lower-ſide it is rounder, and on the back-ſide divided into two lobes, ſeparated by the occipital ſeptum of the dura mater.

It is made up, like the cerebrum, of two ſubſtances; but it has no circumvolutions on its ſurface. Its ſulci are pretty deep, and diſpoſed in ſuch a manner as to form that flat ſtrata, more or leſs horizontal, between which the internal lamina of the pia mater inſinuates itſelf by a number of ſepta, equal to that of the ſtrata.

Under the tranſverſe ſeptum, it is covered by a vaſcular texture, which communicates with the plexus choroides. It has two middle eminences called appendices vermiformes, one anterior and ſuperior which is turned forward, the other poſterior and inferior which goes backward. There are likewiſe two lateral appendices, both turned outward. They are termed vermiformes, from their reſemblance to a large portion of an earth-worm.

Beſides the diviſion of the cerebellum into lateral portions, or into two lobes, each of theſe lobes ſeems to me likewiſe ſubdivided into three protuberances, one anterior, one middle or lateral, and one poſterior; but they are not in all ſubjects equally diſtinguiſhed either by their convexity or limits; but they may always be diſtinguiſhed by the direction of their ſtrata, thoſe of the middle and anterior protuberances being leſs tranſverſe than in the poſterior.

When we ſeparate the two lateral portions or lobes, having firſt made a pretty deep inciſion, we diſcover firſt of all the poſterior portion of the medulla oblongata; and in the poſterior ſurface of this portion, from the tubercula quadrigemina, all the way to the poſterior notch of the body of the cerebellum, we obſerve an oblong cavity, which terminates backward, like the point of a writing pen. This cavity is called the fourth ventricle.

The medulla oblongata is a medullary ſubſtance, ſituated from before backward, in the middle part of the baſis of the cerebrum and cerebellum, without any diſcontinuation, between the lateral parts of both theſe baſes; and therefore it may be looked upon as one middle medullary baſis, common to both cerebrum and cerebellum, by the reciprocal continuity of their medullary ſubſtances, through the great notch in the tranſverſe ſeptum of the dura mater, which common baſis lies immediately on that portion of the dura mater which lines the baſis of the cranium. The medulla oblongata is therefore juſtly eſteemed to be a third general part of the whole maſs of the brain, or as the common production or united elongation of the whole medullary ſubſtance of the cerebrum and cerebellum.

The lower ſide of the medulla oblongata, in an inverted ſituation, preſents to our view ſeveral parts, which are in general either medullary productions, trunks of nerves, or trunks of blood-veſſels.

The chief medullary productions are theſe: the

the large or anterior branches of the medullary oblongata, which have likewiſe been named crura anteriora, femora and brachia medullæ oblongatæ, and pedunculi cerebri; the tranſverſe protuberance, called alſo proceſſus annularis or pons varolii; the ſmall or poſterior branches, called pedunculus cerebelli, or crura poſteriora medullæ oblongatæ; the extremity or cauda of the medulla oblongata, with two pairs of tubercles, one of which is named corpora olivaria, the other corpora pyramidalia: and to all theſe productions we muſt add a production of the infundibulum and two medullary papillæ.

We muſt obſerve in general concerning the eminences of the medulla oblongata, that thoſe which are medullary on their outſides or ſurfaces, are interiorly either entirely cortical, or partly cortical and partly medullary, or formed by a ſingular mixture of theſe two ſubſtances.

From this common portion of the cerebrum and cerebellum, ariſe almoſt all the nerves which go out of the cranium through the different foramina by which its baſis is perforated. It likewiſe produces the medulla ſpinalis, which is no more than a common elongation of the cerebrum and cerebellum, and of their different ſubſtances; and therefore the medulla oblongata may be juſtly ſaid to be the firſt origin or primitive of all the nerves which go out through the ſpina dorſi, and conſequently of all the nerves of the human body. See the articles MEDULLA *Spinalis*, and NERVE. *Winſlow's Anatomy*.

BRAKE, in the marine, the handle or leaver of a common pump, by which it is wrought: it is fitted to go between two ears at the upper part of the pump, through both of which, and a hole in the brake, is thruſt an iron pin, upon which the leaver reſts, as it draws up the water through the tube. See the article PUMP.

BRAKES, a name by which the fern is called in ſeveral parts of England. See the article FERN.

BRAMBLE, in botany; ſee the article RUBUS.

BRAMBLE-NET, otherwiſe called hallier, is a net to catch birds in, of ſeveral ſizes; the great meſhes muſt be four inches ſquare; thoſe of the leaſt ſize are three or four inches ſquare; and thoſe of the biggeſt five. In the depth, they ſhould not be above three or four inches; but as for the length, they may be enlarged at pleaſure; the ſhorteſt being eighteen feet long.

BRAMINS, the name of the prieſts among the idolatrous Indians, the ſucceſſors of the ancient Brachmans. See the article BRACHMANS.

BRAN, the ſkins or huſks of corn, eſpecially wheat ground, ſeparated from the flour by a ſieve or boulter.

BRANCA URSINA, bears-beech, in botany. See the article ACANTHUS.

BRANCH, in botany, an arm of a tree, or a part which, ſprouting out from the trunk, helps to form the head or crown thereof. The branches of a tree bear a reſemblance to the exterior members or limbs of animals, and are of the ſame nature with the trunk; for their inward parts conſiſt of a multitude of tubes, which are alſo provided with a number of ſmall glands, veins, and muſcles, interſperſed here and there, where the ſap coming from the firſt canal is rendered much more delicate: often branches riſe without order and in confuſion from the trunk, as in the elm, oak, and others. With ſome plants they are more elegant and regularly placed, as in the fir-trees, &c. Branches are diſtinguiſhed into various kinds: 1ſt, Wood branches, which are thoſe that form the ſhape of the tree: 2dly, Fruit branches, which are ſlenderer than the wood branches, and have their eyes near to each other, and large, by which the fruit buds are formed: 3dly, Luxuriant branches, which are ſuch as ſhoot out from the large wood branches: 4thly, Irregular branches, ſuch as are ſmall and confuſed: 5thly, Spurious wood branches, ſuch as come contrary to the order of nature. The diſtinguiſhing marks of good branches are, that the eyes in the whole extent be thick, well-fed, and cloſe to each other. The good ſtrong branches are employed in producing yearly on their extremities other new branches, ſome ſtrong and others weak. The good weak branches are ſuch as are well placed, and being of a mean thickneſs and length, may be able to produce ſpeedily beautiful and good fruit. The diſtinguiſhing marks of bad branches are, when the lower part of the eyes are flat, ill fed, and hardly formed, and at a large diſtance from each other. For the method of managing branches, ſee the article PRUNING.

BRANCH, in fortification. See BOYAU.

BRANCH is likewiſe a term uſed in genealogy and anatomy. Thus we ſay, the branch of a family, the branch of an artery, the branch of a vein.

BRANCHES *of a Bridle*, in the manege, are two pieces of iron bended, which in the interval, between the one and the other, bear the bit-mouth, the croſs-chains, and the curb; ſo that on one end they anſwer to the head-ſtall, and on the other to the reins, in order to keep the horſe's head in ſubjection.

BRANCHES *of Ogives*, in architecture, are the arches of Gothic vaults. Theſe arches traverſing from one angle to another diagonal wiſe, form a croſs between the other arches, which make the ſides of the ſquare, of which the arches are diagonals.

BRANCH *of a Trench*. See BOYAU.

BRANCH *of a Mine*. See GALLERY.

BRANCH-STAND, with falconers, a term uſed to ſignify the making a hawk leap from tree to tree, till the dog ſprings the game.

BRANCHER, among ſportſmen, a young hawk,

hawk, newly taken out of the neſt, that can hop from bough to bough.

BRANCHERY, in the anatomy of plants, denotes the ramifications of the ſucciferous veſſels diſperſed through the parenchyma, or pulpy parts of fruits.

The main branches are uſually twenty in number; one half, or fifteen, being diſtributed over the parenchyma, and the reſt, running from the ſtalk in a ſtraight line, meet the former at the cork or ſhoot of the flower: to theſe laſt the coats of the kernels are faſtened.

BRANCHIÆ, Gills, in the anatomy of fiſhes, the parts correſponding to the lungs of land-animals, by which fiſhes take in and throw out again a certain quantity of water, impregnated with air. All fiſhes, except the cetaceous ones and the petromyzon, are furniſhed with theſe organs of reſpiration; which are always eight in number, four on each ſide the throat; that next the heart is always the leaſt, the reſt increaſing in order as they ſtand near the head of the fiſh.

Each of theſe gills is compoſed of a bony lamina, in form of a ſemicircle, for the moſt part; and on its convex ſide ſtand the leaves or lamellæ, like ſo many ſickles. The whole convex part of the lamellæ is beſet with hairs, which are longeſt near the baſe, and decreaſe gradually as they approach towards the point. There are alſo hairs on the concave ſide of the lamellæ, but ſhorter than the others, and continued only to its middle.

The convex ſide of one lamina is fitted into the concave ſide of the next ſuperior one; and all of them are connected together by means of a membrane, which reaches from their baſe half way their height, where it grows thicker, and in ſome meaſure reſembles a rope. The reſt of the lamina is free, and terminates in a very fine and flexible point.

As to the uſe of theſe gills, they ſeem to be deſigned to receive the blood protruded from the heart into the aorta, and convey it into the extremities of the lamellæ; from whence being returned by veins, it is diſtributed over the body of the fiſh.

BRANCHIARUM Foramina, *Apertures of the Gills.* In moſt fiſhes there is only one aperture; in the cartilaginous ones, theſe apertures are ten in number, five on each ſide; and in the petromyzon or lamprey, there are no leſs than fourteen of theſe apertures, ſeven on each ſide.

As to the cetaceous fiſhes, they have no aperture of this kind; and the reaſon ſeems to be, becauſe they are furniſhed with lungs.

BRANCHIDÆ, in Grecian antiquity, prieſts of the temple of Apollo, which was at Didymus in Ionia, a province of Leſſer Aſia, towards the Ægean ſea, upon the frontiers of Caria. They opened to Xerxes the temple of Apollo, the riches whereof he took away: after which, thinking it unſafe to ſtay in Greece, they fled to Sagdiana, on the other ſide of the Caſpian ſea, upon the frontiers of Perſia, where they built a city, called by their own name: but they did not eſcape the puniſhment of their crime; for Alexander the Great, having conquered Darius, king of Perſia, and being informed of their treachery, put them all to the ſword, and razed their city; thus puniſhing the impiety of the fathers in the poſterity.

BRANDY, a ſpirituous and inflammable liquor, extracted from wine and other liquors by diſtillation, which is moſt generally performed by the common alembic; but ſometimes alſo in balneum mariæ. See Distillation.

The chief uſe of brandy is as a drink, particularly in the northern countries, among the negroes of Guinea, who will ſell one another for ſome bottles of brandy, and among the ſavages of Canada, who are extremely fond of it. Brandy is alſo uſed in medicine, to ſtrengthen the nerves; and in dying, rectified ſpirits of wine being reckoned by the dyers among the non-colouring drugs.

Method of colouring Brandy. All brandies, when firſt made, are as clear as water, and grow higher coloured by long keeping: however, they are artfully made of any colour ſeveral ways. To make a light ſtraw-colour, uſe turmeric, or a little treacle: but the beſt way is to give it a colour or tincture with a little burnt ſugar, made to a conſiſtence; or ſyrup of elder-berries may be uſed, which gives an admirable colour, and may be made deeper or lighter, according to the quantity you put in.

Beſides the brandy made of wine, there is ſome alſo made of beer, cyder, ſyrups, ſugar, molaſſes, fruit, grain, &c. however, theſe are not properly called brandy; but go under the general denomination of ſpirits. See the articles Rum, Arrack, &c.

Wine brandy made in France, is eſteemed the beſt in Europe. They make it wherever they make wine; and for that purpoſe, uſe wine that is pricked, rather than good wine.

BRASIDIA, an anniverſary ſolemnity at Sparta, in memory of Braſidas, a Lacedæmonian captain, famous for his atchievements at Methone, Pylos, and Amphipolis. It was celebrated with ſacrifices and games, wherein none were permitted to contend, but free-born Spartans. Whoever neglected to be preſent at the ſolemnity, was fined.

Brasil, or Brazil, in natural hiſtory, is a red wood, brought from the province of that name in South-America. There are different ſorts of it, diſtinguiſhed by the names of Fernambouc, St. Martha, &c. What differences there are in the trees we know not: the woods, brought to us, differ little otherwiſe than as different parts of one log, ſome pieces being richer in colour than others.

This wood is called, by Caſpar Bauhipe, baſtard red-ſaunders, *Pſeudoſant alum rubrum ſive arbor Braziliæ.* Many have confounded it with the true red-ſaunders: the college of Bruſſels, in their account of that wood, have plainly miſtaken the Brazil for it: however the two trees may be allied in their botanic characters, the woods, chemically conſidered, are very obviouſly different; Brazil wood readily giving out its red colour to water, whilſt ſaunders gives no red tinge to any aqueous liquor. The watery tincture of Brazil, however, is not quite ſo deep as that made in rectified ſpirit of wine, or in volatile alkaline ſpirits.

The ſpirituous tincture ſtains warm marble of a purpliſh red, which, upon increaſing the heat, becomes violet. Mr. du Fay informs us, in a paper upon this ſubject in the French Memoirs, that if the ſtained marble be covered with wax, and conſiderably heated, it changes through all the ſhades of brown, and fixes at laſt in a chocolate colour.

The colour of the watery decoction is heightened by alum, and inclined to a crimſon. A decoction made with alum, in the proportion of about one part of the ſalt to four of the wood, yields upon adding alkaline ley or volatile ſpirits, a kind of crimſon lake verging a little to violet.

Solution of tin in aqua-fortis, added to the decoction, throws down a much finer coloured precipitate, little inferior in beauty to carmine. This experiment, firſt communicated in the *Acta Naturæ Curioſorum*, has been ſeveral times repeated with ſucceſs. The quantiy of lake is largeſt when alum is uſed in making the decoction; but the colour is much finer without it.

BRASS, or, as the French call it, YELLOW-COPPER, is a factitious metal, made of copper and lapis calaminaris.

The method of preparing it is as follows: The lapis, having been calcined and ground fine as flour, is mixed with fine charcoal, and incorporated, by means of water, into a maſs: this being done, about ſeven pounds of lapis calaminaris is put into a melting pot that will contain about a gallon, and over that about five pounds of copper; this pot is let down into a wind furnace, where it remains for eleven hours, in which time it is converted into braſs. The metal then is caſt, either into plates or lumps; forty-five pounds of crude lapis calaminaris will produce thirty pounds when calcined or burned. Sometimes braſs-ſhruff is uſed inſtead of copper; but that is not always to be procured in quantities ſufficient, it being no other than a collection of old braſs.

Pure braſs is not malleable, unleſs when it is hot; for when it is cold it will break; and after it has been melted twice, it will be no longer in a condition to bear the hammer at all: but in order to render it capable of being wrought, they put ſeven pounds of lead to an hundred weight of braſs, which renders it more ſoft and pliable.

The beſt proportion for braſs-guns is ſaid to be a thouſand pounds of copper, nine hundred pounds of tin, and ſix hundred pounds of braſs, in eleven or twelve thouſand weight of metal.

The beſt braſs guns are made of malleable metal, not of pure copper and calamine alone; but worſer metals are uſed to make it run cloſer and ſounder, as lead and pot-metal. See CANNON.

Braſs may be cleanſed, firſt, by rubbing it with a cloth dipped in equal quantities of aqua-fortis and common water; then with an oily cloth, and laſtly, with a dry one dipped in lapis calaminaris.

Braſs is tinged of a gold colour, firſt, by burning, then diſſolving it in aqua-fortis, and laſtly, reducing it to its metalline ſtate. It may be whitened by heating it red-hot, and quenching it in water diſtilled from ſal ammoniac and egg-ſhells. It is ſilvered, or coloured ſuperficially white, by rubbing it with balls made of ſilver diſſolved in aqua-fortis, with powder of white tartar, ſufficient to abſorb all the moiſture thereof.

Corinthian BRASS has been famous in antiquity, and is a mixture of gold, ſilver, and copper. L. Mummius having ſacked and burned the city of Corinth, 146 years before Chriſt, it is ſaid this metal was formed from the immenſe quantities of gold, ſilver, and copper, wherewith that city abounded, thus melted and run together by the violence of the conflagration.

BRASS-COLOUR, one prepared by the braziers and colourmen to imitate braſs. There are two ſorts of it, the red braſs, or bronze, and the yellow or gilt braſs; the latter is made only of copper-filings, the ſmalleſt and brighteſt that can be found; with the former they mix ſome red ochre, finely pulverized: they are both uſed with varniſh.

BRASSICA, in botany; ſee the article CABBAGE.

BRASSICAVIT, or BRACHICAVIT, in the manege, is a horſe whoſe fore legs are naturally bended archwiſe: being ſo called by way of diſtinction from an arched horſe, whoſe legs are bowed by hard labour.

BRAULS, Indian cloths with blue and white ſtripes. They are otherwiſe called turbans, becauſe they ſerve to cover thoſe ornaments of the head, particularly on the coaſt of Africa.

BRAURONIA, in Grecian antiquity, a feſtival in honour of Diana, ſurnamed Brauronia, from its having been obſerved at Brauron, an Athenian borough.

BRAWN, the fleſh of a boar ſouſed or pickled; for which end the boar ſhould be old, becauſe the older he is, the more horny will the brawn be.

The method of preparing brawn is as follows: The boar being killed, it is the flitches only, without

out the legs, that are made brawn; the bones of which are to be taken out, and then the flesh sprinkled with salt, and laid in a tray, that the blood may drain off: then it is to be salted a little, and rolled up as hard as possible. The length of the collar of brawn should be as much as one side of the boar will bear; so that when rolled up, it will be nine or ten inches diameter.

The collar being thus rolled up, is to be boiled in a copper, or large kettle, till it is so tender that you can run a straw through it; then set it by, till it is thorough cold, and put it into the following pickle. To every gallon of water, put a handful or two of salt, and as much wheat bran: boil them together, then drain the bran as clear as you can from the liquor; and when the liquor is quite cold, put the brawn into it.

BRAZING, the soldering or joining two pieces of iron together, by means of thin plates of brass, melted between the pieces that are to be joined. If the work be very fine, as when two leaves of a broken saw are to be brazed together, they cover it with pulverized borax, melted with water, that it may incorporate with the brass powder, which is added to it: the piece is then exposed to the fire without touching the coals, and heated till the brass is seen to run.

BRAZING is also the joining two pieces of iron together by heating them hot, the one upon the other, which is used for large pieces by farriers, &c.

BREACH, in fortification, a gap made in any part of the works of a town by the cannon or mines of the besiegers, in order to make an attack upon the place.

A practical breach is that where men may mount, and make a lodgment, and ought to be fifteen or twenty feet wide.

BREACH, in a legal sense, is where a person breaks through the conditions of a bond or covenant, on an action upon which the breach must be assigned: nor must the assignment be general; it must be particular; as in an action of covenant for repairing houses, it ought to be assigned particularly what the want of reparation really is; and in such certain manner that the defendant may take an issue.

BREAD, *Panis*, a mass of dough kneaded and baked in an oven.

We find bread sometimes made of rye, of oats, and of barley; but that prepared from wheat is by far the most wholesome. In several parts of Asia, Africa, and America, they make bread of maize, or Indian corn; and in some parts the Americans make bread of the cassava-root. See CASSAVA.

BREADTH, in geometry, one of the three dimensions of bodies, and which, multiplied into the length, produces a surface.

BREAKERS, a name given by sailors to the waves, which breaking violently over rocks immediately under the surface of the water, cover that part of the sea with foam: they are otherwise to be distinguished by a hoarse and terrible roaring, continued with a sound very different from what they have in the offing, or at a distance from the land.

When a ship is unhappily driven amongst these, it is hardly possible she can be saved, as every billow that heaves her upwards, dashes her down with additional force, when it breaks amongst the rocks or sands: we have ourselves seen the surges break over the mast head in such a situation, whither the remainder of an unfortunate crew had fought a last refuge.

BREAKING-BULK, in the marine, unloading the first part of a ship's cargo.

BREAK-WATER, the hull or lower frame of some old ship or vessel, sunk at the entrance of a small harbour, to break off the force of the waves from the vessels which are moored within it.

BREAK-WATER is likewise a small buoy fastened to a large one in the water, when the buoy-rope of the latter is not long enough to reach from the anchor at the bottom to the surface of the water: the use of this break-water is to shew where the buoy swims. See the article BUOY.

BREAM, *Brama*, in ichthyology, the name of a fish, of which there are two sorts, one found in the fresh, and the other in the salt water. The former is the cyprimus, and has all its fins black; and the latter the reddish sparus, having eleven parallel and gold coloured lines on each side.

BREAMING, in the marine, the act of burning off the filth, such as grass, ooze, or shells, from a ship's bottom, that had gathered to it in a voyage, or by lying long in a harbour.

BREAMING is performed by holding kindled furze or faggots to the ship's bottom: the flame immediately incorporating with the pitch, sulphur, &c. that had formerly covered the bottom, directly loosens and throws off whatever excrement may have adhered to it: after this cleansing, it is covered a-new with a composition of tallow, sulphur, turpentine, &c. and this not only makes the bottom smooth and slippery, so that it more readily divides the fluid, but greatly contributes to poison the worms that eat through a ship's planks, as long it remains there. See CAREEN, DOCK.

BREAST, *Pectus*, in anatomy, the fore-part of the thorax. See THORAX.

BREASTS, *Mammæ*, in anatomy; see the article MAMMÆ.

BREAST-FAST, in the marine, a hawser, or large rope that confines a ship to a wharf, or other place sideways.

BREAST-Hooks, in naval architecture, strong crooked pieces of timber fayed a-cross the inside of a ship's bows, or fore-part, and bolted to the stem and foremost timbers. See CANT-TIMBERS, STEM.

The

The breaſt-hooks are the principal ſupport of the ſhip forward, as they bear all the ſhock of reſiſtance which ſhe receives in dividing the fluid.

BREAST-PLATE, in antiquity, a piece of armour worn to defend the breaſt, originally believed to be made of hides, or hemp twiſted into ſmall cords; but afterwards made of braſs, iron, or other metals, which were ſometimes ſo exquiſitely hardened, as to be proof againſt the greateſt force.

BREAST-PLATE, in the manege, the ſtrap of leather that runs from one ſide of the ſaddle to the other, over the horſe's breaſt, in order to keep the ſaddle tight, and hinder it from ſliding backwards.

BREAST-PLOUGH, one ſo faſhioned that a man may ſhove it before him.

BREAST-WORK, the ſame with parapet. See the article PARAPET.

BREECH *of a great Gun*, or *Cannon*, the end next the touch-hole.

BREECHING, in the marine, a thick rope uſed to ſecure the cannon of a ſhip of war, and prevent them from recoiling too much in the time of battle.

It is fixed by faſtening the middle part of it to the caſcabel, or hindmoſt knob of the cannon, called by ſeamen the pomiglion; afterwards the two ends of it are inſerted through two ſtrong iron rings in the outſides of the carriage, and faſtened to eye-bolts in the ſhip's ſide: the breeching is of ſufficient length to let the muzzle of the cannon come within the ſhip's ſide.

BREEZE, a ſhifting wind that blows from ſea or land for ſome certain hours in the day or night; common in Africa, and ſome parts of the Eaſt and Weſt-Indies.

The ſea-breeze is only ſenſible near the coaſts; it commonly riſes in the morning, about nine, proceeding ſlowly in a fine ſmall black curl on the water, towards the ſhore; it increaſes gradually till twelve, and dies about five. Upon its ceaſing, the land-breeze commences, which increaſes till twelve at night, and is ſucceeded in the morning by the ſea-breeze again.

BREEZE, in brick-making, ſmall aſhes and cinders, ſometimes made uſe of inſtead of coals, for the burning of bricks: but as this does not ſo well anſwer the end, the uſe of it is prohibited by 12 Geo. I. cap. XXXV.

BREGMA, in anatomy, the ſame with ſinciput. See SINCIPUT.

The bregma conſiſts of two bones, which are bones of the cranium, called oſſa parietalia.

BRENT-GOOSE, a ſpecies of gooſe with a black neck and a white collar round; uſually confounded with the barnacle, though in reality a diſtinct ſpecies.

It is a little larger than the common duck, and is deſcribed by authors under the name of *anas torquata*.

BREST, or BREAST, in architecture, a term ſometimes uſed for the member of a column, more uſually called torus. See the article TORUS.

BREST-SUMMERS, in timber buildings, are pieces in the outward parts thereof, into which the girders are framed: this in the ground-floor is called a cill; and in the garret-floor a beam.

As to their ſize, it is the ſame with that of girders. See the article GIRDERS.

BREVE, in law, is any writ directed to the chancellor, judges, ſheriffs, or other officers, whereby a perſon is ſummoned, or attached, to anſwer in the king's courts, &c.

BREVE PERQUIRERE, the purchaſing of a writ or licence for trial in the king's courts: whence comes the preſent uſage of paying ſix ſhillings and eight-pence fine to the king in ſuit, for money due on bond, where the debt is forty pounds, and of ten ſhillings where it is a hundred pounds, &c.

BREVE DE RECTO is a writ of right, or licence, for a perſon ejected to ſue for the poſſeſſion of the eſtate detained from him.

BREVE, in muſic, a note or character of time, in the form of a diamond, or ſquare, without any tail, and equivalent to two meaſures, or ſemibreves.

BREVE, or BREVIS, in grammar: ſyllables are diſtinguiſhed into longs and breves, according as they are pronounced quicker or more ſlow.

BREVIER, among printers, a ſmall kind of type, or letter, between nonpareil and bourgeois.

BREVIS, in anatomy, an appellation given to ſeveral muſcles, on account of their ſhortneſs. Thus,

BREVIS CUBITI, in anatomy, is a muſcle that riſes from the ſuperior and poſterior part of the humerus, and by joining its fleſhy fibres with the brachiæus externus and longus, and becoming tendinous, covers the elbow, and is inſerted into the olecranium, to extend the arm.

BREVIS RADII, a muſcle which comes from the external and upper part of the ulna, and paſſing round the radius, is inſerted into its upper and fore part, below the tendon of the biceps: this and the longus radii are called the ſupinators, their office being to turn the palm upwards.

BREVIS PALMARIS lies under the aponeuroſis of the palmaris, and ariſes from the bone of the metacarpus that ſuſtains the little finger, and from that bone of the carpus which lies above the reſt: it goes tranſverſly, and is inſerted into the eighth bone of the carpus: it aſſiſts in making the palm of the hand concave.

BREVITY, in matters of ſtile, is a perfection of diſcourſe, whereby all ſuperfluous words are rejected, and only ſuch as are abſolutely neceſſary uſed. However, as brevity is apt to degenerate into obſcurity, it is a leſs fault to ſay too much than too little.

BREW-HOUSE, a building adapted to the brewing, &c. of malt liquors.

In order to erect a large or public brew-houſe to the beſt advantage, ſeveral circumſtances ſhould be carefully obſerved. 1. That three ſides in four of the upper-part, or ſecond floor, be built with wooden battons about three inches broad, and two thick, that a ſufficient quantity of air may be admitted to the backs or coolers. 2. That the coppers be erected of a proper height above the maſhing-ſtage, that the hot water may be conveyed by means of cocks into the maſh-tuns, and the worts into the coolers. 3. That the fire-places of the coppers be very near each other, that one ſtoker, or perſon who looks after the fire, may attend all. 4. That the yard for coals be as near as poſſible to the fire-places of the copper. 5. That the malt be ground near the maſh-tuns, and the mill erected high enough that the malt may be conveyed from the mill immediately into the maſh tuns, by means of a ſquare wooden ſpout or gutter. 6. That the upper backs be not erected above thirty-three feet above the reſervoir of water, that being the greateſt height water can be raiſed by means of a common ſingle pump. 7. That the pumps which raiſe the water, or liquor, as the brewers call it, out of the reſervoir into the water-backs, and alſo thoſe which raiſe the worts out of the jack-back into the coppers, be placed ſo that they may be worked by the horſe-mill which grinds the malt.

BREWING, the operation of preparing ale, or beer, from malt. The uſual proceſs of brewing is as follows: the ingredients being ready, the water muſt be made to boil very ſpeedily, and while boiling with the greateſt violence the fire muſt be immediately damped, or put out; when the height of the ſteam is over, the water is put into the maſhing-tun to wet the malt; then ſo much being poured out as to make it of a conſiſtence ſtiff enough to be rowed up, let it ſtand thus a quarter of an hour, after which another quantity of the water is added, and rowed up as before; at laſt the full quantity of water is poured upon it, and that in proportion as the liquor is intended to be ſtrong or weak: this part of the operation is called maſhing. Afterwards the whole may be left to ſtand two or three hours, more or leſs, according to the ſtrength of the wort, or the difference of the weather; then let it run into the receiver, and maſh again for a ſecond wort in the ſame manner as for the firſt, only the water muſt be cooler, and muſt not ſtand above half the time.

The two worts being mixed together, the quantity of hops that is deſigned may be added thereto, and the liquor put into the copper, which being cloſely covered up, let it boil gently for the ſpace of an hour or two; then let the liquor into the receiver, and the hops ſtrained from it into the coolers.

When cool, the yeaſt is applied; which done, it is left to work or ferment, till it be fit to tun up.

For ſmall beer there muſt be a third maſhing; the water muſt be near cold, and to ſtand not above three quarters of an hour; to be hopped and boiled at diſcretion.

For double ale, or beer, the two liquors coming from the two firſt maſhings muſt be uſed as liquor for a third maſhing of freſh malt. For fine ale, the liquor thus brewed is farther prepared with molaſſes: inſtead of yeaſt, or baum, ſome uſe Caſtile ſoap, others flour and eggs, others an eſſential oil of barley, others a quinteſſence of malt, others of wine, and others the ſal panariſtus.

In ordering veſſels for the preſervation of beer, they muſt not at one time be ſcalded, and at another waſhed with cold water: ſome rub the veſſels with hop-leaves, that come out of the wort, and ſo rinſe them again; then being dried in the air, and headed, they take a long piece of canvas, and dipping it in brimſtone make matches thereof, and with a few coriander-ſeeds ſet fire thereto: others opening the bung let the match burn in the veſſel, keeping in as much as they can of the ſulphureous fume, by laying the bung lightly on, and when the match is burnt, they ſtop all cloſe for a little time; then being opened, and coming to the air, the caſk is found to be as ſweet as a violet.

BREWING, in the ſea-language, the appearance of a collection of black and gloomy clouds gradually ariſing from a particular part of the hemiſphere, as the fore-runner of a ſquall or ſtorm.

BREYNIA, in botany, a genus of polyandrious plants, claſſed by Linnæus with the capparis. There are two ſpecies in this genus, which are both natives of the warm parts of America; but being impatient of cold, they muſt be kept in a hot-houſe in this climate to preſerve them. For their generical characters, ſee the article CAPPARIS.

BRIAR, in botany, a ſpecies of the roſe. See the article ROSE.

BRIBERY, in common law, is when a perſon in judicial places, takes a gift or reward of any perſon who has buſineſs before him, for his doing his office, or by colour of his office, except the king only, unleſs it be meat and drink.

BRICK, a fat reddiſh earth, formed into long ſquares, four inches broad, and eight or nine long, by means of a wooden mould, and then baked or burnt in a kiln, to ſerve the purpoſes of building.

Among us they are various, according to their various forms, dimenſions, uſes, method of making, &c. the principal of which are, compaſs bricks, of a circular form, uſed in ſtaining of walls: concave, or hollow bricks, on one ſide flat like a common brick, on the other hollowed, and uſed for conveyance of water: feather-edged bricks,

which are like common ſtatute bricks, only thinner on one edge than the other, and uſed for penning up the brick pannels in timber buildings: cogging bricks are uſed for making the indented works under the coping of walls built with great bricks: coping bricks, formed on purpoſe for coping of walls: Dutch or Flemiſh bricks, uſed to pave yards, or ſtables, and for ſoap-boilers vaults and ciſterns: clinkers, ſuch bricks as are glazed by the heat of the fire in making: ſandal or ſamel bricks are ſuch as lie outmoſt in a kiln, or clamp, and conſequently are ſoft and uſeleſs, as not being thoroughly burnt: great bricks are thoſe twelve inches long, ſix broad, and three thick, uſed to build fence walls: plaiſter or buttreſs bricks have a notch at one end, half the breadth of the brick; their uſe is to bind the work which is built of great bricks: ſtatute bricks, or ſmall common bricks, ought, when burnt, to be nine inches long, four and a quarter broad, and two and a half thick; they are commonly uſed in paving cellars, ſinks, hearths, &c.

The Method of burning BRICKS.—Bricks are burnt either in a kiln or clamp. Thoſe that are burnt in a kiln are firſt ſet or placed in it, and then the kiln being covered with pieces of bricks, they put in ſome wood, to dry them with a gentle fire; and this they continue till the bricks are pretty dry, which is known by the ſmoke's turning from a darkiſh colour to a tranſparent ſmoke: they then leave off putting in wood, and proceed to make ready for burning, which is performed by putting in bruſh, furze, ſpray, heath, brake, or fern faggots; but before they put in any faggots, they dam up the mouth or mouths of the kiln with pieces of bricks, which they call ſhinlog, piled one upon another, and cloſe it up with wet brick-earth, inſtead of mortar.

The ſhinlog they make ſo high, that there is but juſt room above it to thruſt in a faggot; they then proceed to put in more faggots, till the kiln and its arches look white, and the fire appears at the top of the kiln; upon which they ſlacken the fire for an hour, and let all cool by degrees. This they continue to do alternately, heating and ſlacking, till the ware be thoroughly burnt, which is uſually effected in forty eight hours.

About London they chiefly burn in clamps, built of the bricks themſelves, after the manner of arches in kilns, with a vacancy between each brick, for the fire to play through; but with this difference, that inſtead of arching, they ſpan it over by making the bricks project one over another, on both ſides of the place, for the wood and coals to lie in till they meet, and are bounded by the bricks at the top, which cloſe all up. The place for the fuel is carried up ſtraight on both ſides, till about three feet high; then they almoſt fill it up with wood, and over that lay a covering of ſea-coal, and then overſpan the arch; but they ſtrew ſea-coal alſo over the clamp betwixt all the rows of bricks; laſtly, they kindle the wood which gives fire to the coal, and when all is burnt, they then conclude the bricks are ſufficiently burnt.

Oil of BRICKS, olive oil imbibed by heated bricks, which are afterwards broken, put into a retort, and the oil again extracted from them by an open fire.

BRICKLAYER, a perſon who lays bricks in the building of walls, houſes, &c.

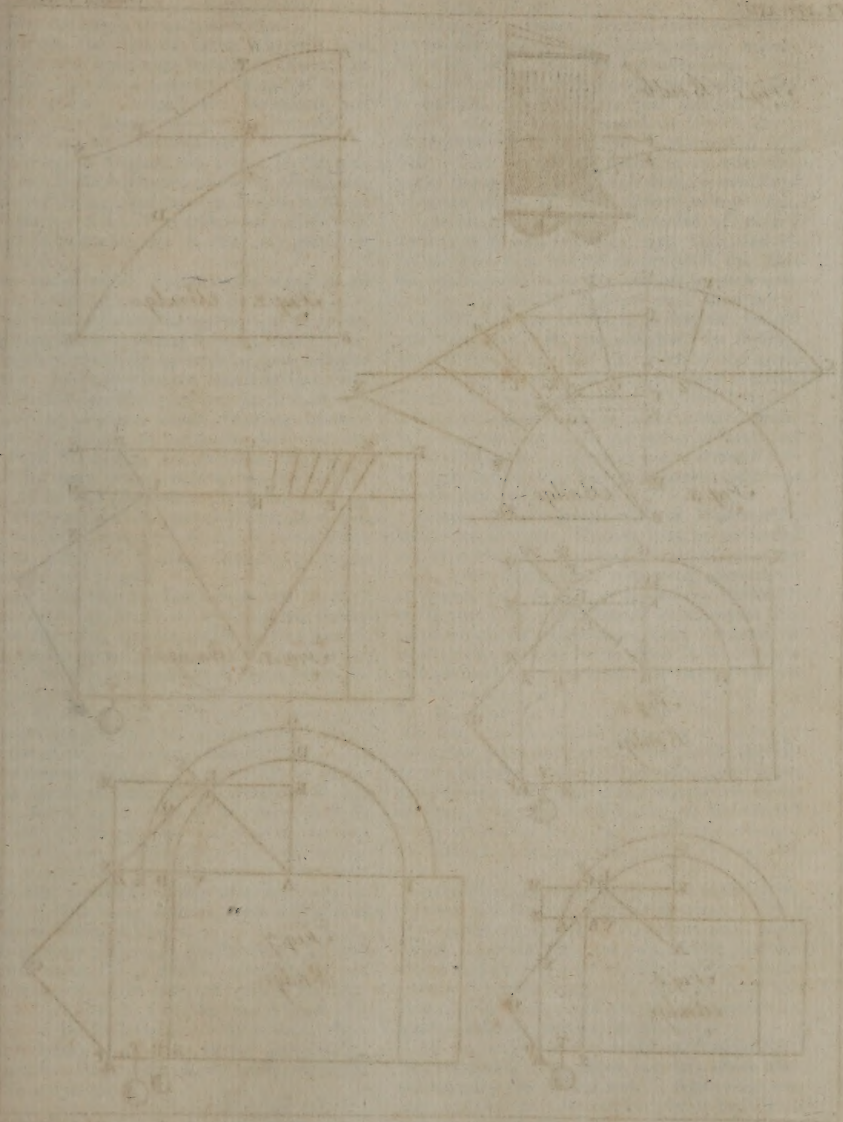
Tilers and bricklayers were incorporated 10 Eliz. under the name of maſter and wardens of the ſociety of freemen of the myſtery and art of tilers and bricklayers.

BRIDGE, a building either of ſtone or timber, conſiſting of one or more arches, erected over a river, canal, or the like, for the conveniency of paſſing the ſame.

The parts of a bridge are the piers, the arches, the pavement, or way over for carriages, the foot-way on each ſide for foot-paſſengers, the rail or parapet which encloſes the whole, and the butments or end of the bridge on the banks. The building of bridges over rivers is very difficult, on account of the great inconveniency in laying the foundation or building under water.

The requiſites that are thought neceſſary by architects, in bridges, are, that they be well deſigned, commodious, durable, and ſuitably decorated. The piers of ſtone bridges ſhould be equal in number, that there may be one arch in the middle, where commonly the current is ſtrongeſt: their thickneſs is not to be leſs than a ſixth part of the ſpan of the arch, nor more than a fourth. They are commonly guarded in front with an angular ſterling, or ſpur, to break the force of the current, though this defence is ſometimes turned ſemicircular. In the ancient bridges it is always a right angle, which has the advantage of being more ſtrong and durable than acute ones.

Among the bridges of antiquity, that built by the emperor Trajan over the Danube was the moſt magnificent of all the works of this kind. It was erected for the conveniency of ſending ſuccours to the Roman legions on the other ſide the Danube, in caſe they ſhould be ſuddenly attacked by the Daci; but demoliſhed by the next ſucceſſor Hadrian, for fear the barbarians, overpowering the guards ſet to defend it, ſhould, by means of it, pour into Mæſia, and cut off the garriſons there; or rather, as ſome think, out of envy, as deſpairing ever to do any thing like it himſelf. The ruins of it are ſtill ſeen in the middle of the Danube, near the city Warhel in Hungary. It conſiſted of twenty arches, each one hundred and fifty feet from pier to pier, and one hundred and fifty feet high.



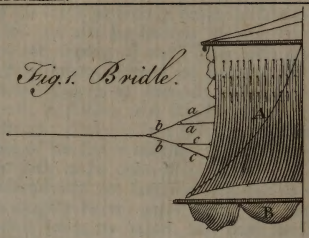


Fig. 1. Bridle.

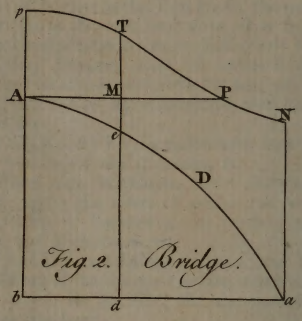


Fig. 2. Bridge.

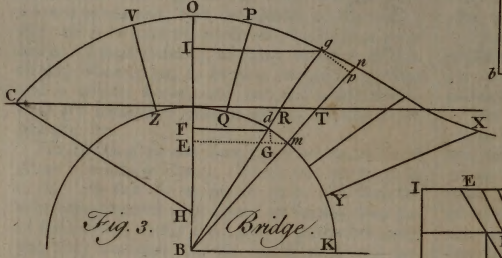


Fig. 3. Bridge.

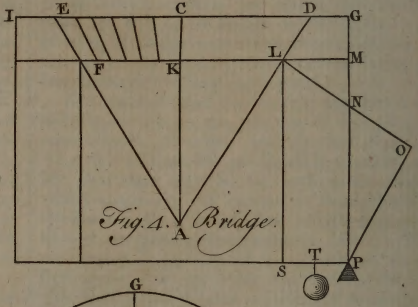


Fig. 4. Bridge.

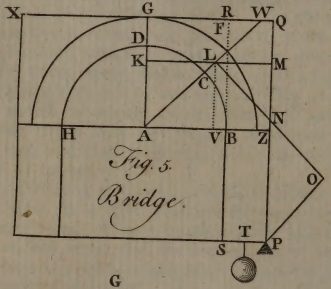


Fig. 5. Bridge.

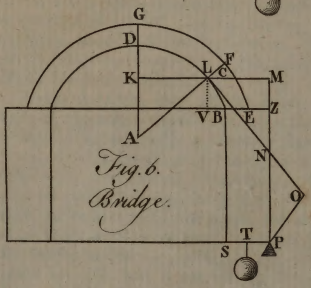


Fig. 6. Bridge.

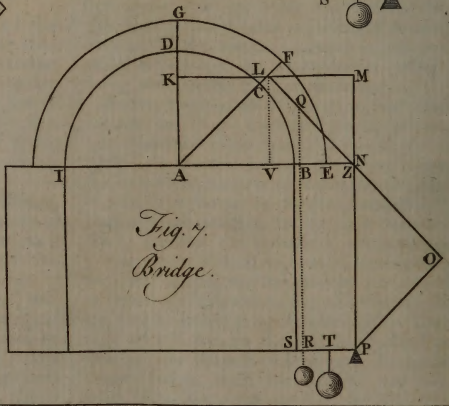


Fig. 7. Bridge.

J. Lodge sculp.

high, and the piers fifty feet thick; its whole length was seven furlongs, which is more than four times the length of London-bridge.

In France, the Pont de Garde is a very bold work, the piers being only thirteen feet thick, yet serving to support an immense weight of a triplicated arcade. It joins two mountains, and consists of three bridges one over another, the uppermost of which is an aqueduct.

The bridge at Avignon was begun in the year 1176, and finished in 1188, consisting of eighteen arches, measuring 1340 paces in length, or about 500 fathoms: divers of its arches have since been demolished by the ice, &c. so that only part of it now subsists.

The bridge of St. Esprit is the finest in all France, consisting of nineteen great arches, besides seven smaller ones, the apertures of the arches being from fifteen to twenty fathoms, which makes the length of the bridge upwards of four hundred fathoms. In the two last mentioned bridges there is this remarkable, that they are not straight, but bent, having an angle, whose convexity is turned towards the stream, to break the force thereof. The Pont St. Esprit, Dr. Robinson observes, is bowed in many places, making unequal angles, especially in those parts where the stream is strongest. The great pier in London-bridge, it is said, was intended to serve for a steadying to the whole machine, instead of making an angle, as in the abovementioned bridges.

The Trajan bridge at Salamanca, over the river Formus, popularly attributed to the giants, and by some to Hercules, appears rather to be a Roman work, though when and by whom erected, is not known; but it was repaired by Trajan, whose denomination it still bears. It is 1500 feet long, consists of twenty-six arches, each seventy-two feet wide; the piers that sustain them being twenty-three feet thick, and two hundred feet high.

The famous bridge of Venice called the Rialto consists but of one arch, and that a flat or low one, passing for a master-piece of art, being built in 1591, after the design of Michael Angelo: the span of the arch is ninety-eight feet and a half, and its height above the water only twenty-three feet. Poulet also mentions a bridge of a single arch in the city of Munster in Bothnia, much bolder than that of the Rialto at Venice.

But these are nothing to a bridge in China built from one mountain to another, consisting of one single arch 400 cubits long, and 500 cubits high, whence it is called the flying bridge; a figure of it is given in the Philosophical Transactions. Kircher also speaks of a bridge in the same country 360 perches long, without any arch, supported only by 300 pillars.

The longest bridge in England is that over the Trent at Burton, built by Bernard, abbot of Burton, in the twelfth century; it is all of squared free stone, and lofty, 1545 feet in length, and consisting of 34 arches: yet this comes far short of the wooden bridge over the Drave, which, according to Dr. Brown, is at least five miles long.

Rochester-bridge is built after the same method as London, only better, in that the arches are wider: it is 550 feet long, and consists of eleven arches, the biggest of which is more than fifty feet. The bridge at Berwick is an admirable work, begun under queen Elizabeth; it consists of seventeen arches, the largest upwards of eighty feet.

London-bridge formerly consisted of twenty arches; it is 900 feet long, sixty high, and seventy-four broad, had a draw-bridge in the middle, and almost twenty feet aperture in each arch. It was supported by eighteen piers, from thirty-four to twenty-five feet thick, so that the greatest water-way, when the tide was above the sterling, was 450 feet, scarce half the width of the river, and below the sterling was no more than 194 feet. Thus a river 900 feet wide was forced through a channel of 194 feet; which caused the fall of water to be so great as to render the passage of boats and other vessels very dangerous; nor is it much better at present, though lately two arches have been thrown into one.

Among modern bridges that of Westminster, built over the river Thames, may be accounted one of the finest in the world: it is forty-four feet wide, a commodious foot-way being allowed for passengers, on each side, of about seven feet broad, raised above the road allowed for carriages, and paved with broad moor-stones, while the space left between them is sufficient to admit three carriages and two horses to go a-breast, without any danger. Its extent from wharf to wharf is 1220 or 1223 feet, being full 300 feet longer than London-bridge. The free water-way under the arches of this bridge is 870 feet, being four times as much as the free water-way left between the sterlings of London-bridge; this disposition, together with the gentleness of the stream, are the chief reasons why no sensible fall of water can ever stop, or, in the least, endanger the smallest boats, in their passage through the arches.

It consists of thirteen large and two small arches, together with fourteen intermediate piers.

Each pier terminates with a saliant right angle against either stream: the two middle piers are each seventeen feet wide at the springing of the arch, and contain 3000 cubic feet, or near 200 tons of solid stone; and the others decrease in width equally on each side by one foot.

All the arches of this bridge are semicircular; they all spring from about two feet above low-water mark; the middle arch is seventy-six feet wide, and the others decrease in breadth equally on each side by four feet.

This

This bridge is built of the beſt materials, and the ſize and diſpoſitions of theſe materials are ſuch, that there is no falſe bearing, or ſo much as a falſe joint in the whole ſtructure; beſides that, it is built in a neat and elegant taſte, and with ſuch ſimplicity and grandeur, that, whether viewed from the water, or by the paſſengers who walk over it, it fills the mind with an agreeable ſurprize. The ſemioctangular towers, which form the receſſes of the foot-way, the manner of placing the lamps, and the height of the baluſtrade, are at once the moſt beautiful, and, in every other reſpect, the beſt contrived.

Blackfriars-bridge, by all appearance at preſent, will be the moſt complete and noble ſtructure of the kind that ever yet has been erected. The firſt pile of this bridge was driven June the 7th, 1760, and the firſt ſtone was laid October 31, 1760, by Sir Thomas Chitty, Knt. Lord-Mayor, attended by the bridge-committee, with great ceremony.

With regard to the ſtrength of arches, much has lately been ſaid by many able mathematicians. Mr. Simpſon tells us, that to obtain a proper idea of the ſtrength of any propoſed arch, there are two things that ought principally to be attended to; the one reſpecting the arch itſelf, ariſing from the length and diſpoſition of the vouſſoirs, or arch-ſtones, and the other with regard to the thickneſs and ſtrength of the piers proper for the ſupport of ſuch an arch. For with reſpect to the former of theſe conſiderations, it is manifeſt, that ſhould the vouſſoirs happen to be ſo ill-adapted to the nature of the curve, and the ſpan of the arch, as to have a tendency to open and ſlip out of their places with a force greater than can be balanced, or taken away by the roughneſs of the ſtone, aſſiſted by the cement, &c. uſed on thoſe occaſions, which is far from being impoſſible; ſuch an arch, on ſtriking the centers, muſt unavoidably fall, however ſtrong its abutments may be. On the other hand, however well an arch may be contrived and proportioned in itſelf, its ruin will be equally certain and inevitable, if the piers on which it is placed ſhould not have a ſufficient degree of ſtrength to reſiſt the lateral preſſure.

When the vouſſoirs are all ſuppoſed of an equal length, it is well known that the catenarian arch is that, wherein all the arch-ſtones will ſtand in equilibrium among themſelves, without any the leaſt aſſiſtance from their roughneſs or adheſion. But arches of this kind (not to inſiſt here on the difficulty of forming the centers neceſſary to their conſtruction) are not altogether proper for bridges over navigable rivers, becauſe their ſpring is not at right angles to the horizon, but conſiderably inclined, ſo as to diminiſh the quantity of the water-way, and to obſtruct the paſſage of veſſels under the bridge, eſpecially near the time of high-water. Arches that take their ſpring from low-water mark, in a direction perpendicular to the horizon, are, beyond all doubt, the beſt adapted to the purpoſes of navigation: but in arches of this ſort, (and ſuch are the ſemi-circular and ſemi-elliptical) the arch-ſtones about the haunches have a ſtrong tendency to quit their places, and force their way outwards, from the lateral preſſure of the upper-part of the arch. A part of this effort is indeed taken away or balanced by the weight of the materials laid upon the arch, in order to the forming the road over the bridge; but to have an exact equilibrium of the arch-ſtones in theſe caſes, their lengths from the key downwards ought to be increaſed in a certain proportion depending on the particular nature of the propoſed extradoſes of every two contiguous arches, that they may meet each other above the center of the piers, ſo as to render the ſpandrals intirely ſolid quite up to high-water mark: and it is certain that an arch ſo conſtructed, whether ſemi-circular or ſemi-elliptical, will not only be ſtronger in itſelf, but alſo act leſs forcibly againſt the piers, than another arch of the ſame figure, ſpan, and quantity of materials, whoſe vouſſoirs are every where of an equal length, throughout the whole extent of the arch; beſides, the piers by this means being rendered intire ſolid ſtone up to high-water mark, they will be leſs liable to be damaged by the water forcing a way into them; a circumſtance worthy notice.

But though it is eaſy to demonſtrate that this is the beſt kind of conſtruction for arches that ſpring at right angles to the horizon, yet to know the exact proportion in which the vouſſoirs ought to be increaſed from the key downwards, and what breadth ought to be given to the piers neceſſary to ſupport them, are matters of much difficulty, and can only be aſcertained from calculations founded on mechanics, and the particular properties of the figure propoſed.

The theory of bridges will be rendered very clear by the ſolutions to the four following problems, which we ſhall preſent to our readers, as they are given by a very ingenious mathematician.

PROBLEM I. To find the nature of the extrados V P X (Plate XXII. *fig.* 2.) of the propoſed circular arch A *d* Y, ſuch that the parts thereof ſhall be in equilibrio by the weights of the vouſſoirs alone, without the help of any wall or counterfort, provided only that the abutments be of ſufficient ſtrength to bear the weight of the whole arch.

SOLUTION. Let B be the center of the circular arch A *d* Y, A B its vertical radius, B K the horizontal one, at right angles to each other; and ſuppoſe *g d m n*, (whoſe joints *g d*, *m n*, being produced, would paſs through the center B) one of the vouſſoirs, whoſe extrados *g n* is required. Produce B A to O, ſo that the axis of the key-ſtone Q P V Z may be of the given length; draw an indefinite

tangent, as CAT to the point A, the vertex of the arch. From the points d, m, (supposed indefinitely near each other) let fall upon AB the perpendiculars dF, mE; and also dG perpendicular to mE. On B, as center with the radius Bg, describe the arch gp, intersecting Bmn in p; let R and T be the points in which the joints Bg and Bn, intersect the horizontal line AT. The angles FdB, ARB or ATB are equal, because of the parallels AR, Fd, and the indefinitely small arch dm; moreover, the angles FdG, Bdm, being right ones, the triangles BFd, mGd, will be similar. Put $AB=a$, $BF=u$, $Fd=y$, $dG=FE=\dot{u}$, $Gm=\dot{y}$, $Bg=s$, and $BO=f$; then $BF:Bd::MG:md$; that is, $u:a::\dot{y}:\frac{a\dot{y}}{u}=md$, and again $BF:Fd::BA:AR$; whence $AR=\frac{a\dot{y}}{u}$, whose fluxion $\frac{a\dot{u}\dot{y}-a\dot{y}\dot{u}}{u^2}=RT$. Now, because $u^2+y^2=aa$, we have $\dot{u}=\frac{-y\dot{y}}{u}$, let this value of $\dot{u}$ be substituted in the above expression for RT, it becomes $\frac{a^3\dot{y}}{u^3}$.

It appears by Corol. 3. Problem XLI. of Clark's Mechanics, that if TR be multiplied by some constant quantity as b, the product will expound the weight with which the voussoir dn must be charged, in order to preserve the equilibrium of the arch. Now as the solid part of the arch is comprised between two vertical planes, it is evident, that the faces of the voussoirs, which are the trapezia $gdmn$, or $gdmp$, may serve to expound the weights of the voussoirs; therefore $gdmp$ will always be equal to $\frac{a^3b\dot{y}}{u^3}$. But by reason of the similar sectors Bdm, Bgp, we have $\overline{Bd}^2(a^2):\overline{Bg}^2-\overline{Bd}^2(ss-aa)::Bdm\left(\frac{a\dot{y}}{u}\times\frac{a}{2}\right):dgpm\left(ss-aa\times\frac{\dot{y}}{2u}\right)$ hence $s^2-a^2\times\frac{\dot{y}}{2u}=\frac{a^3b\dot{y}}{u^3}$, and $ss-aa=\frac{2a^3b}{u^2}$, from whence we get $s=\frac{a}{u}\times\sqrt{2ab+u^2}$, this, when $u=a$, becomes $ff=2ab+aa$, consequently $b=\frac{ff-aa}{2a}$; let this value of b be substituted in the equation $s=\frac{a}{b}\sqrt{2ab+u^2}$, it becomes $s=\frac{a}{u}\times\sqrt{f^2-a^2+u^2}$; draw the ordinate gI to the axis OB; then will BI be a fourth proportional to Bd, BF, BG, and is therefore equal to $\sqrt{ff-a^2+u^2}$; hence this construction:

Take the key-stone QPVZQ at pleasure, the lines VZ, PQ, tending to the center B. From A, draw the horizontal line CAT; and from the center B, with BO, as radius, describe the circular arch OC, meeting TAC in C; take any point at pleasure, as d, upon the intrados, and make AH equal to the perpendicular distance of d from the radius BK. Draw CH, make BI $=$HC; and from I, draw Ig, meeting Bd produced in g, which will be one point in the required extrados; in the same manner other points may be found, by which the extrados OgX my be determined.

If AD (Plate XXII. *fig.* 3.) be a given arch, whose extrados is pTN, axis Ab, semispan ba, and Ap the given height of the vertex of the required extrados from that of the arch; and from A, a right line AMP be drawn parallel to the horizontal line ba; also through any point M, a right line parallel to Ab; then will Te (Aba being a quadrant of a circle), the height of the extrados above the point e of the proposed arch, be inversely as the cube of the right line ed. But if Aea be the arch of an ellipsis; then having first multiplied the square of ed, by the square of the semi-transverse ba, and the square of the horizontal distance AM, by the square of the semi-conjugate Ab, and subtracted one product from the other, the height eT of the required extrados will be directly as that difference, and inversely as the cube of ed.

If the proposed arch be the curve of an hyperbola; then having multiplied the square of the de's by that of the semiordinate ba, and the square of the horizontal distances AM, by the corresponding part Ab of the axis, and taken the sum of those products, the ratio of the heights eT will be compounded of the direct ratio of those sums, and inverse ratio of the cubes of the heights de. M. Parent's *Essais & Recherches de Mathematique*, vol. 3. p. 168.

Problem. II. To determine the thickness of the piers necessary to sustain in equilibrio the part of a propofed semi-circular arch.

Solution. Let SZ (Plate XXII. *fig.* 4.) be one of the required piers of the semi-circular arch, whose half is represented by BEDG. Through L, the the middle of FC, draw MK parallel to ZA, and produce PZ to M. Let fall LV perpendicular upon AB; and from L draw LO at right angles to LA, meeting the perpendicular PO in O. From Q, the center of gravity of the voussoir CE, let fall QR perpendicular upon the base SP of the pier, bisect PS in T; call LK or KA, a, LA, b, BV, c, ZP, d, ZBor RS, g, PS, y; then will ML or MN be equal to $c+y$, and $MP=a+d$; consequently $NP=a+d-c-y$. Put $a+d-c=f$, then $NP=f-y$, and $PR=y-g$. If for the surface of the voussoir CG, or its equal CE, we put n^2, then will $\frac{bn^2}{a}$ express the force of the voussoir in the direction LO. By similar the triangles LKA, NOP,

we have LA (b) : LK (a) :: NP ($f-y$) : PO equal to $\frac{af-ay}{b}$, which being multiplied by $\frac{bn^2}{a}$, gives $n^2 f - n^2 y$ for the force acting at right angles upon the arm PO of the lever RPO, whose center of motion is P; therefore, by the well known properties of the lever, $n^2 \times \overline{y-g}$ and $\frac{dy^2}{2}$, are the respective forces acting at the points T, R, in a direction perpendicular to the horizon; and consequently $nnf - nny = \frac{ddy}{2} + n^2 y - n^2 g$. From this equation, by compleating the square and proper reduction, we get $y = \sqrt{\frac{2n^2 f + 2n^2 g}{d} + \frac{4n^4}{d^2}} - \frac{2n^2}{d}$.

When the extrados of the arch BDH (Plate XXII. *fig.* 5.) is terminated by a horizontal line QX; then, having taken FC=DG, and drawn LO perpendicular to FC, in the middle point L as before, and other things remaining still the same, put MP=f, then by the similar triangles LKA, PON, we have LA : LK :: PN : PO, whence $PO = \frac{af-ae-ay}{b}$. Now the absolute weight of the voussoir CWGD, here supposed $= n^2$, is to the force thereof, acting in the direction LO, as LK : LA by the nature of bodies resting upon inclined planes, and is therefore equal to $\frac{n^2 b}{a}$, which, being multiplied by PO, becomes $fnn - enn - n^2 y$: and this product must, by the nature of the lever, be equal to the weight of the pier PQRS, multiplied by PT; hence this equation, $fn^2 - en^2 - n^2 y = \frac{dy^2}{2}$, from whence we get $y = \frac{n^4}{d^2} - \frac{n^2}{d} + \sqrt{\frac{2fn^2 - 2en^2}{d}}$.

Problem III. To determine the thickness of the piers necessary to sustain in equilibrio the parts of a proposed semi-elliptical arch.

Solution. Let SZ (Plate XXII. *fig.* 6.) be one of the required piers of the semi-elliptical arch, whose half is represented by BEGD. From the middle of the arch BD, draw LO a tangent to that point, and erect the perpendicular LA, which produce to A. From L, let fall PO perpendicular upon LO; and through L, draw MLK parallel to the semi-transverse axis BH. Put LK=a, KA=b, LA=c, BV=d, BS=f, MP=g, n^2 for the surface of the voussoir CG, nearly equal to FB, ZB=y. By the similar triangles LKA, LMN, we have AK : KL :: LM : MN; whence $MN = \frac{ay+ad}{b}$, and thence $NP = \frac{gb-ad-ay}{b}$: and again, by the similar triangles LKO, NOP, we get $PO = \frac{gb-ad-ay}{c}$.

Now the absolute weight of the voussoir LFGD, is to its pressure upon FL, as LK to LA; consequently $\frac{cn^2}{a} \times \frac{gb-ad-ay}{c}$, expresses the force acting upon the point O, in the direction LO. On the other hand, the resistance of the pier SZ will be expressed by $\frac{fy^2}{2} + ny^2$ (PT being equal to TS, and P considered as the center of motion of the lever OPT): hence, by making the force and resistance equal, we shall have $\frac{gbn^2}{a} - \frac{dn^2}{a} - n^2 y = \frac{fy^2}{2} + n^2 y$; and consequently $y = \sqrt{\frac{2gbn^2}{ef} - \frac{2dn^2}{f} + \frac{4n^3}{f^2}} - \frac{2n^2}{f}$.

Problem IV. To determine the thickness of the piers necessary to support in equilibrio the proposed voussoirs, when ranged in a right line.

Solution. Upon LF (*fig.* 7.) the given distance between the piers describe an equilateral triangle LAF; and divide its base LF, into as many equal parts as there are voussoirs. From A, draw through those points of division right lines terminating in the indefinite right line GI (drawn parallel to LF, at a given distance therefrom) in the points E, C, D, &c. From L draw LO at right angles to AD, and from P let fall PO perpendicular thereon. Produce KL to M, and draw AKC perpendicular to LF. Put KL=aKA=b, MP=f, LM=y, and n^2 for the area of LDCK.

The triangles AKL, LMN, and NOP, are similar; hence KA (b) : KL (a) :: LM (y) : MN $\left(\frac{ay}{b}\right)$; and consequently $NP = \frac{fb-ay}{b}$. Again, AL ($2a$) : AK (b) :: NP $\left(\frac{fb-ay}{b}\right)$: PO $\frac{fb-ay}{2a}$. The absolute weight of LDCK is to its force upon the pier SM, as LK to LA; but LA is double to LK. Therefore the force acting upon O in the direction LO may be expounded by $2nn$, which being multiplied by PO, gives $\frac{bfn^2}{a} - n^2 y$; for the force acting upon P at the distance PO, which, by the property of the lever, must be equal to the force acting upon the point

D

PLATE XXIII.

Facing Bridge of Boats.

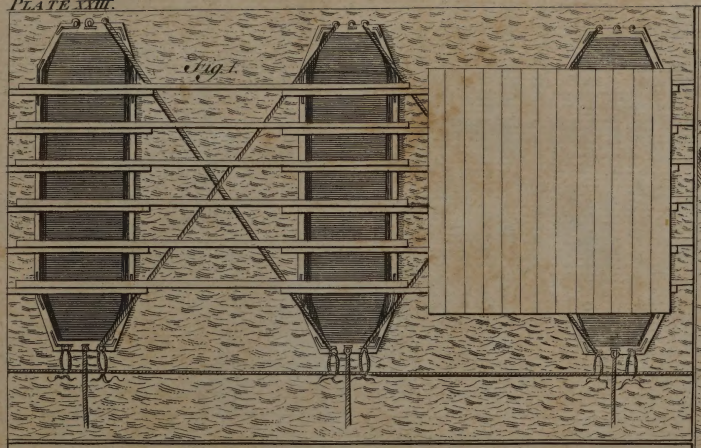


Fig. 1.

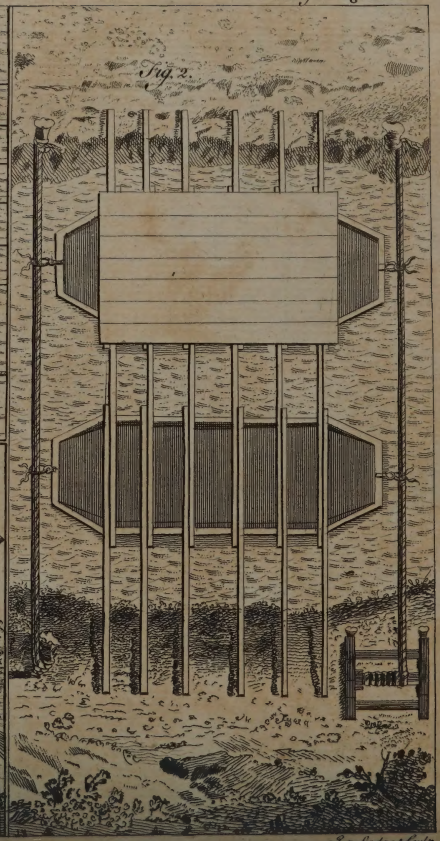


Fig. 2.

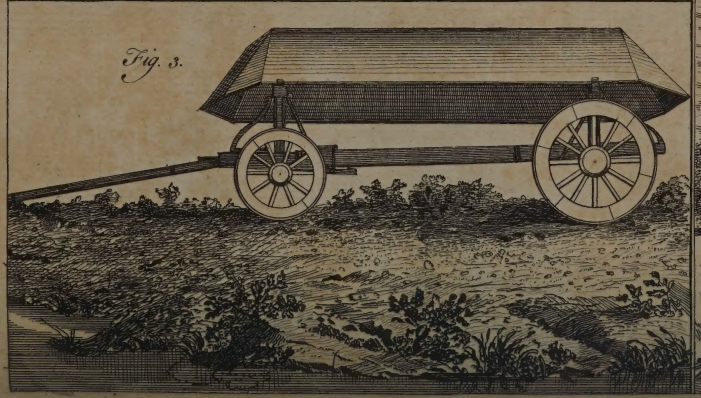


Fig. 3.

P. Lodge Sculp.

D, at the distance of half PS therefrom. But this is expounded by $\frac{fyy}{2}$ hence $\frac{bfnn}{a} - nny = \frac{fyy}{2}$; and consequently $y = \sqrt{\frac{2bny}{a^2} + \frac{n^4}{f^2}} - \frac{n^2}{f}$.

BRIDGE, in gunnery, the two pieces of timber which go between the two transums of a gun-carriage, on which the bed rests.

BRIDGE, in music, a term for that part of stringed instruments over which the strings are stretched. The bridge of a violin is about one inch and a quarter high, and near an inch and half long.

BRIDGES, in artillery, machines of various constructions for crossing a river, the most considerable of which are called bridges of boats.

These bridges are made with boats, which are placed at small distances from each other, the whole width of the river, parallel to their lengths, and covered with planks, which rest on pieces of wood, called *poutrelles* or joists, firmly fixed to the boats.

There are bridges of boats of many sorts; some are constructed with copper-boats, which in artillery are called *pontons*, and these are carried with an army on carts or drays, made for that purpose; others are constructed with the common boats found on the rivers which are to be passed.

To construct a bridge of boats, the boats are bound together with strong ropes reaching diagonally across their distances, from the head of one to the stern of the other, as is represented in Plate XXIII. *fig.* 1, and 2. Across these boats are laid the *poutrelles*, and upon them strong planks of deal, which are firmly nailed on; fir-planks are preferred, because that wood is lighter and less brittle than oak.

When the river over which the bridge is to be laid is very rapid, anchors are let down from the cord or cable to which all the boats are fastened; these anchors are first cast into the river, and the cord is then drawn as tight as possible by capsterns on each bank, that the boats may be more securely fixed; these cords or cables are called, in artillery, *cinquenelles*, and are generally one inch and an half in diameter, and an hundred fathoms long.

The boats have also anchors, by means of which their situation is rendered more steady and secure, and capable of making a stronger resistance to the tide or motion of the water.

Fig. 1. in Plate XXIII. shews part of a bridge of boats which is not entirely covered with planks, that the arrangement and distance of the poutrelles may appear. The same method is observed in the bridge of boats represented by *fig.* 2. in the same Plate. This bridge is only for passing small rivers,

Fig. 3. in Plate XXIII. shows a ponton mounted on its carriage or cart.

M. de St. Remy observes in his Memoirs, that the pontons which were in use before the time of the Marquis de la Frezeliere, lieutenant-general of the artillery, (which post he filled with great distinction) not being capable of transporting twenty-four pounders over large rivers, without danger of sinking, because they lay so near the water's edge, contrived others longer and higher, which were capable of transporting the heaviest pieces of artillery over any river, without danger of the like inconveniency. The principal dimensions of these boats, according to this author, are as follow:

Their height is 2 feet 9 inches.
Their width 5 feet 6 inches.
Their length 18 feet 6 inches.

The poutrelles, which are fir, as well as the planks with which they are covered, are 22 feet long, four feet and an half wide, and of a proportionable thickness.

The planks are 14 feet long, 13 inches wide, and 2 inches thick.

The distance between each boat, or ponton, ought to be 9 feet.

Besides the bridges already mentioned, which are most common, there are yet others called *ponts volants* or *flying bridges*. These are sometimes boats, joined together by strong ropes, and frequently with chains, upon which a sufficient number of madriers, or planks, are disposed, so as to make a platform proper to receive cannon, and on which they may be fired, either to oppose or favour the passage of a river. An epaulement, or side-work of defence, is also made musket-proof to cover the men who occupy this bridge and play the cannon.

The *pont volant* is also sometimes a bridge made of one great boat, or several smaller boats, which floating, is drawn across a river, by means of some machines or cords which communicate with the opposite side.

Sometimes the pont volans is composed of two boats joined together by a flooring of poutrelles or madriers, and surrounded with a rail or balustrade, having also one or more masts, for supporting a cable, one end of which is fastened to a roller, or windlass, fixed in the middle between the two boats sterns: the other end of the cable is fastened to an anchor, sunk at a considerable distance higher up the river: the cable after passing between two parallel beams, reaching from one mast-head to the other, is supported at proper distances, by boats, to prevent it from sinking: by this contrivance the bridge becomes moveable from one side of the river to the other, like a pendulum, without any other help than the rudder: for as soon as the boats heads are directed obliquely across the stream, the force of the current

current continually impreſſes that part of the bridge, and urges it towards the other ſhore. Theſe bridges conſiſt alſo ſometimes of two ſtories, for the quicker paſſage of a great number of men; or, that the cavalry and infantry may paſs at the ſame time.

A bridge is alſo called a *pont volant*, which is made over ſmall rivulets four or five fathoms wide, and compoſed of two bridges, one laid on the other, in ſuch manner as that the upper one may be thrown forward by means of cords and pullies properly diſpoſed in the lower. Theſe bridges can never be large, becauſe the weight of the upper-bridge, when it runs out, or is thrown forward, would, if not very ſmall, break all its faſtening to the under-bridge, and ſo the whole machine would be rendered uſeleſs; and for this reaſon they are never uſed but for paſſing ditches, foſſes, or rivulets not wider than four or five fathom.

Beſides theſe, there is yet another ſort of pont volant, made uſe of in war on ſeveral occaſions, called a *raft* or *float*. This is made of many rafters, or pieces of timber, which together form a kind of floor; theſe are covered with planks, or ſtrong madriers, and a certain number of empty caſks are made faſt to the ends of the rafters, the better to ſupport the float, and whatever is placed upon it. Theſe floats are uſed to tranſport troops, cannon, &c. over rivers.

BRIDLE, in the manege, a contrivance made of ſtraps or thongs of leather and pieces of iron, in order to keep a horſe in ſubjection and obedience.

BRIDLE-*Hand* is the horſeman's left hand, the right hand being the ſpear or ſword-hand.

To ſwallow the BRIDLE, is ſaid of a horſe that has too wide a mouth, and too ſmall a bit-mouth.

BRIDLE, *Frænum*, in anatomy. See the article FRÆNUM.

BRIDLES, in the marine, the upper part of the moorings laid in the king's harbours, to ride ſhips or veſſels of war. See the article MOORINGS.

Bowline-BRIDLES. We have explained under the article Bowline, that the uſe of that rope is to bind the weather-edge, or the edge next the wind, tight forward, when a ſhip has her ſails properly trimmed for a contrary wind; for as the current of air at this time is nearly parallel to the ſurface, the ridge of the ſail into which the wind or current of air enters, muſt of neceſſity be ſhaken by it, unleſs it is faſtened to prevent it: but as a ſingle rope has been found not ſo convenient for this purpoſe, as acting only upon one part of the ridge of the ſail, bridles were therefore applied, i. e. two or three additional parts, repreſented in Plate XXII. *fig.* 1. where A is part of the weather-ſide of a top-ſail, *a a* the upper-bridle, *b b* the middle, and *c c* the lower-bridle, *d* part of the bowline, into which they are united, drawn tight.

BRIEF, in common law, a writ whereby a man is ſummoned or attached to anſwer any action.

It is called brief becauſe it is couched in a few words, without any preamble.

BRIEF is alſo uſed for a writing iſſued out of any of the king's courts of record at Weſtminſter, whereby ſomething is commanded to be done, in order to juſtice, or the execution of the king's command.

BRIEF is alſo taken for a letter-patent, granting a licence to a ſubject to make collection for any public or private loſs, as briefs for loſs by fire, to be read by miniſters in churches, &c.

BRIEF is likewiſe an abridgement of a client's caſe, wrote out for the inſtruction of counſel, on a trial at law.

Apoſtolical BRIEFS, letters which the pope diſpatches to princes, or other magiſtrates, relating to any public affair.

BRIG, or BRIGANTINE, in the marine, a merchant-ſhip of two maſts. The term brigantine is not univerſally confined to veſſels of a particular conſtruction, but is variouſly applied by the mariners of different European nations to a peculiar ſort of ſhip of their own marine.

Amongſt Engliſh ſailors, this veſſel is diſtinguiſhed by having her mainſail ſet fore and aft, or lengthways; whereas the mainſails of larger ſhips are hung athwart, or at right angles with her length, and faſtened to a yard that hangs parallel to the deck; but here the foremoſt edge of the mainſail is faſtened in different places to hoops that go round the mainmaſt, and ſlide up and down on it, as the ſail is to be hoiſted or looſened; it is extended by a gaff above and a boom below. See the articles BOOM and GAFF.

BRIGADE, in the military art, a party or diviſion of a body of ſoldiers, whether horſe or foot, under the command of a brigadier.

BRIGADE-MAJOR is an officer appointed by the brigadier, to aſſiſt him in the management and ordering of his brigade.

BRIGADIER, in military affairs, the officer whoſe degree is the next above that of a colonel.

There are brigadiers of infantry, cavalry, and dragoons. The duty or office of the brigadier is to command a corps conſiſting of ſeveral regiments, called a brigade.

The brigades of infantry commonly conſiſt of four or five battalions, and ſometimes ſix; and the brigades of cavalry of eight or ten ſquadrons.

The brigadiers are on duty each one day ſucceſſively, and by turns: their ſervice conſiſts in aſſiſting the general officers, who are in a rank above them, in whatever concerns the order and ſecurity of the camp poſſeſſed by the army, and to execute the orders they receive concerning theſe affairs.

The brigadier is not a general officer, but appointed to command only his own particular brigade,

gade, and not any other distant corps of the army.

BRILLIANT, in a general sense, something that has a lucid and bright appearance.

BRILLIANT *Diamonds*. See the article DIAMOND.

BRIMSTONE, in natural history, the same with sulphur. See SULPHUR.

BRIMSTONE-WORT, in botany. See PEUCEDANUM.

BRINE, water replete with saline particles; or pickle. See SALT.

BRINGING-TO, in navigation, the act of stopping a ship in her progress at sea or near the land.

It is done by disposing the sails in such a manner to the direction of the wind, as to counteract each other; so that while some of them impel the ship forward, the rest force her to retreat.

The use of bringing-to is either to speak with some other ship at a distance, which is advancing, to sound, or to wait for day-light, or clear weather, in case of running on land, rocks, shallows, &c. supposed to be near.

BRINGING-BY-THE-LEE, in navigation. See the article BROACHING-TO.

BRISTOL-WATER. These waters are the fourth in degree amongst the waters which are esteemed warm. The waters of Bath are the first, Buxton the second, and Matlock the third.

The diseases in which Bristol waters are properly prescribed, are internal hæmorrhages and inflammations, blood-spitting, dysentery, an immoderate flux of the menses, and purulent ulcers of the viscera: hence in consumptions, the dropsy, scurvy with heat, stone, gravel, strangury, the habitual gout, scorbutic rheumatism, diabetes, slow fevers, atrophy, venereal disease, cancer, gleets in both sexes, king's evil, &c. in all these disorders, Bath-waters are not only improper, but hurtful; they rouse the too languid, and quicken the too lazy circulation; they allay the heat, and restrain the too rapid motion of the blood. The former attemperate the choleric, and the latter impregnate the phlegmatic. In short, Bath-water seems to be adapted to the maladies of the stomach, guts, and nerves; Bristol, to those of the lungs, kidneys, and bladder: again, Bath-waters are at variance with a milk course; and the Bristol can never be judiciously directed, but when they may be joined with reason and success.

The Bristol-waters are taken medicinally only during the hot months, as from April to September.

BRITANNICA, among the ancient physicians, the name by which they called the great water-dock; a powerful astringent, which they prescribed in hæmorrhages, and other fluxes. See LAPATHUM.

BRITTLENESS, that quality of bodies on account of which they are denominated brittle; or which subjects them to be easily broken.

BRIZA, in botany, a genus of triandrious plants, whose corolla is composed of two valves; the lower valve is of the size and shape of the cup; the upper valve is small, plane, and roundish, shutting up the hollow of the other. It contains three hairy filaments topped with oblong antheræ; the corolla serving in the place of a pericarpium, incloses the seed, and when ripe drops it out. The seed is single, small, roundish, and compressed.

BRIZE, in husbandry, denotes ground that has lain long untilled.

BROACHING-TO, in navigation, the act of bringing a ship's side to the windward, when she had been steering more before it.

As a ship can carry much more sail before the wind than when she bears her side to it, this is a most pernicious event, which is often attended with very fatal consequences; such as rending the sails to pieces, carrying away the masts, and even, perhaps, overturning the ship; it is occasioned either by the negligence or incapacity of the men who steer.

It is easy to conceive that, when the current of air is acting nearly end-ways on a ship as she divides the fluid, that the pressure of the wind upon the masts must be considerably diminished as she flies from it; and that if she carries a great sail at this time, it can only press her fore-part lower down in the water: but if, when carrying a great weight of sail, her side is suddenly brought to the wind, the whole force of it must pour like a torrent into the cavities of her sails, and the masts thereby unavoidably pressing, like a leaver, on the hull sideways, they must go near to overset, if the sails are not immediately reduced, which is hardly possible to be done in so short a time, or the masts may be carried away, or the sails torn to pieces, by which she may recover her situation.

The difference between broaching-to and bringing-by-the-lee may be thus understood. Suppose a ship, with all sail set, is steering north, and having the wind S. S. W. then is west the weather, and east the lee-side.

If by a neglect of the helmsman her head is brought round to the westward, so as that her sails are taken all aback before he can make her return to the course from which she had deviated, she has broached-to.

If otherwise, her head is from the same cause directed so far eastward as to lay the sails aback, she is said to be brought-by-the-lee. See ABACK.

BROAD, an appellation given to things whose breadth bears a considerable proportion to their length.

BROADSIDE, in a sea-fight, the whole dis-

charge of the artillery on one ſide of a ſhip of war on her enemy.

BROCADE, or BROCADO, a ſtuff of gold, ſilver, or ſilk, raiſed and enriched with flowers, foliages, and other ornaments, according to the fancy of the merchants or manufacturers.

BROCCOLI, in gardening, the Italian name for a ſpecies of the braſſica or cabbage, much cultivated in England for culinary uſe in winter: there are two ſorts commonly raiſed, and diſtinguiſhed by the names of purple and white broccoli. Theſe plants are propagated by ſowing their ſeeds; the ſeaſon for which is the latter end of May or beginning of June on a bed of good earth, and kept well-watered in dry weather. When the plants are got about three inches high, they ſhould be tranſplanted into beds at about four inches aſunder; here they may remain till the latter end of July or beginning of Auguſt, when (taking if poſſible the advantage of moiſt weather) they may be planted out where they are to remain, at the diſtance of three feet row from row, and two feet in the rows, and placed alternately. The ſoil in which they ſhould be planted ought to be rich, rather light than heavy: towards the end of December, if the weather is not ſevere, they will begin to ſhow their ſmall heads, which, eſpecially at their firſt appearance, are not unlike cauliflowers. Theſe heads ſhould be cut off before they run to ſeed, with about four or five inches of the ſtalk, and a great number of ſprouts or ſide-ſhoots, produced from the ſtem, will ſucceed them, and continue fit for eating till April: though they are not ſo large as the former, yet they are equally as well taſted, if not ſuperior in flavour.

In order to ſave good ſeeds of broccoli, there ſhould be reſerved a few of the largeſt heads to run up to ſeed, obſerving to ſtrip off the ſide-ſhoots, leaving only the principal head to flower, with this precaution, not to let any other plant of the ſame genus be near them when in bloſſom, as the effluvia might occaſion a degeneracy. If this practice is duly obſerved, the ſort may be preſerved in perfection many years, and the ſeed as good as thoſe procured from abroad.

Another ſort, called the brown or black broccoli, is by many greatly eſteemed, but is much inferior, in reſpect to the palate, to the former; therefore, the only recommendation which can be given to it is, that it is much hardier, and will bear the ſeverity of winter better; and is on that account a good ſubſtitute when the other ſorts have failed. This ſort will grow very tall, and therefore ſhould have the earth drawn up to their ſtems, as they advance in height. This does not form heads ſo perfect as the Italian broccoli, the ſtems and hearts of the plants being the parts which are eaten. For the generical characters of the broccoli, ſee the article CABBAGE.

BROCK, among ſportſmen, a term uſed to denote a badger.

A hart too of the third year is called a brock, or brocket; and a hind of the ſame year a brocket's ſiſter.

BROKEN-BACKED, in the marine, a ſhip is ſaid to be ſo when either by her weakneſs, age, or ſome great ſtrain, ſhe is ſo looſened in the middle as to droop at each end. See KEEL, CAMBERING.

This is more frequent in French ſhips than Engliſh or Dutch, owng partly to the floor not being carried ſufficiently forward and aft, or farther from the middle towards the ends, and partly from being obliged frequently to have a great weight in both ends when they are empty in the middle, at the time of delivering one cargo and taking in another.

BROKER, a name given to perſons of ſeveral and very different profeſſions, the chief of which are exchange-brokers, ſtock-brokers, pawn-brokers, and brokers, ſimply ſo called, who ſell houſhold furniture and ſecond-hand apparel.

BROMELIA, a genus of hexandrious plants, reſembling ſome ſorts of aloes. From the center of the plant ariſes the flower-ſtalk, the lower part of which is garniſhed with leaves placed alternately at every joint. The upper part of the ſtalk is furniſhed with flowers ſet in a looſe ſpike quite round; theſe have three narrow herbaceous petals, ſitting upon the germen, and within are ſix ſlender filaments topped with oblong antheræ, which with the ſtyle are ſhorter than the petals. Theſe flowers in their native country are ſucceeded by oval ſeed-veſſels having a longitudinal partition, in the center of which are faſtened ſeveral ſmooth cylindrical ſeeds. Theſe plants grow naturally in divers parts of the Weſt-Indies, and are propagated by ſeeds. To this genus Linnæus has added the ananas or pine-apple.

BRONCHIA, in anatomy, the ramification of the trachea.

The bronchia, in their origin, are formed of imperfect annuli, and in their progreſs of cartilaginous and membraneous fruſtæ, very curiouſly connected and joined together. Theſe have their origin from the trachea; and after being ſubdivided into innumerable ramifications, finally terminate in thoſe ſmall veſicles which form the greater part of the ſubſtance of the lungs. Theſe veſicles have interſtices all the way between them, and adhere, as it were, to the branches of the bronchia, in the manner of cluſters of grapes. See the article LUNGS.

The word is Greek, βρογχια, which ſignifies the ſame thing.

BRONCHIAL ARTERY, a veſſel allotted to the nutrition of the lungs.

It riſes ſometimes ſingle, ſometimes double, ſometimes

ſometimes triple, from the aorta and intercoſtals, and adheres every-where firmly to the bronchia.

BRONCHIAL-VEIN ariſes either from the intercoſtals, or from the vena azygos; accompanies the artery, and divides into the ſame number of branches with it. As the artery brings blood to the bronchia for the nutrition thereof, and of the veſicles of the lungs, ſo the vein carries off the blood again to the cava, where it ſoon terminates.

BRONCOCHELE, in ſurgery, a tumour ariſing in the anterior part of the neck, from the reſiſting flatus or air, ſome humour or other violence, as ſtraining in labour, lifting of weights, &c.

The word is formed from the Greek, βρογχος, the wind-pipe, and κηλη, a tumour.

BRONCHOTOMY, in ſurgery, an inciſion made in the aſpera arteria, or wind-pipe, which is neceſſary in many caſes, and eſpecially in a violent quinſey, to prevent ſuffocation from the great inflammation or tumour of the parts. It is alſo called laryngotomy and tracheotomy.

The word is formed from the Greek, βρογχος, the wind-pipe, and τεμνω, to cut.

There are ſeveral methods of performing this operation; but that which exceeds the reſt, as being moſt eaſy and expeditious, and occaſioning the leaſt wound and pain to the patient, is by an inſtrument conſiſting of a ſmall tube, in which is contained a triangular needle called a trochar. This inſtrument is ſo managed, as to paſs through the middle of the trachea by one puſh; and after drawing out the needle from the tube, the latter is left in the wound, till the patient recovers. Bronchotomy ſhould be performed in time, while there is ſufficient ſtrength and hopes of the patient's recovery; for when the patient is ſpent, it is uſually performed in vain. If a drowned perſon has but juſt expired, or not continued long under water, the moſt certain and expeditious way of recovering him, will be by opening the trachea with ſuch inſtrument as is neareſt at hand, and afterwards to inflate or blow into his lungs either with the naked mouth, or with a tube.

BRONCHUS, βρογχος, in anatomy, the aſpera arteria, or wind-pipe, which reaches from the larynx to the lungs.

BRONTIÆ, *Thunder-Stones*, in natural hiſtory, the ſame with the belemnitæ. See the article BELEMNITES.

BRONTIUM, βροντειον, in Grecian antiquity, a place underneath the floor of the theatres, in which were kept brazen veſſels full of ſtones and other materials, with which they imitated the noiſe of thunder.

BRONTOLOGY denotes the doctrine of thunder, or an explanation of its cauſes, phænomena, &c. together with the preſages drawn from it. See THUNDER.

The word is formed from the Greek, βροντη, thunder, and λογος, a diſcourſe.

BRONZE, a compound metal, two thirds of which conſiſts of copper, and one third of braſs.

BRONZING, the act of colouring by metalline powders, plaſter, or other buſts and figures, in order to make them appear as if caſt of bronze, copper, or other metals.

The old method of uſing a cement in bronzing was, to mix the powders with ſtrong gum-water, or iſinglaſs ſize; and then with a bruſh, or pencil, to lay them on the ſubject; but the artiſts at preſent uſe the japanners gold ſize: and proceed in all reſpects in the ſame manner as in gilding with the powders in other caſes. See GILDING.

BROOK-LIME, in botany, a herb which produces white, fibrous, creeping roots. The ſtalks, which ariſe from the roots, are thick, ſucculent, and ſmooth, emitting roots from their joints, whereby they ſpread and propagate. The leaves are oval, ſmooth, flat, ſucculent, and of a dark green colour, ſtanding oppoſite. The flowers come out in long bunches from the wings of the ſtalk; they are monopetalous, and of a bright blue colour, reſting on ſhort footſtalks; theſe flowers are produced a great part of the ſummer, and are ſucceeded by cordated ſeed-veſſels, filled with roundiſh ſeeds. This herb grows naturally in brooks and ſtreams of water in many parts of England; it has no remarkable taſte, but is preferred to other more acrid antiſcorbutics, as it abounds with ſuch parts as to enable it to abrade and clear away thoſe little viſcoſities that obſtruct the capillaries, and occaſion ſcabs and blotches. The doſe of the juice is four ounces, but it is beſt mixed with the juice of oranges, and then it may have a very good effect in hot ſcurvies. It is alſo diuretic, and a great cleanſer of the viſcera, which gives it frequently a place in antiſcorbutic and deobſtruent compoſitions. This plant is a ſpecies of the veronica, though, by ſome authors, claſſed with the anagallis, and called alſo beccabunga.

BROOM, *Geniſta*, in botany, a ſhrub which grows naturally upon open heaths, &c. in many parts of England: the root is hard, woody, tough, yellow, and hath crooked fibres; the ſtalks are ſlender, woody, and about two feet high, ſending out many ſlender branches; theſe are angular, green, and tough, and furniſhed with ſmall, hairy, dark-green leaves, ſometimes growing three together, and ſometimes ſingle; the flowers that grow thereon are of a bright yellow and papilionaceous, with crooked ſtamina and ſaffron-coloured apices, to which ſucceed flat broad pods, which are blackiſh when ripe, containing ſeveral flat, hard, kidney-ſhaped ſeeds.

Broom is extremely pernicious to arable and paſture land, and therefore ought by all means to be rooted out, which is the only method of killing it; on bar-

barren grounds, indeed, it is a good improvement; for, beſides its uſe as fuel, it makes an excellent and laſting thatch, if well laid on.

This plant is intenſely bitter, and the leaves, tops, and branches, decocted in wine or water, are uſeful in dropſies, and all obſtructions of the kidneys and bladder; for they partly purge off the ſerous humours by ſtool, and partly by urine.

Many gather the yellow buds of this plant, and pickle them with ſalt and vinegar, in the ſame manner as capers, from which they are not then to be diſtinguiſhed. The flowers are moſt in uſe, and are accounted ſplenetic, nephritic, and hepatic.

Butcher's BROOM. See RUSCUS.

Spaniſh BROOM. See SPARTIUM.

BROWALIA, in botany, an annual didynamious plant, which uſually grows about two feet high, and ſpreads out into lateral branches on every ſide of the ſtalk: theſe are furniſhed with oval entire leaves, ending in a point, and ſupported by ſhort foot-ſtalks. Near the extremities of the branches the flowers come out ſingly upon long pedicles, which ariſe from the wings of the leaves, each flower having a monophyllous tubulated calyx indented in five parts; from the center of which ariſes a monopetalous funnel-ſhaped corolla, which is crooked and bent downward; the top of the tube is ſpread open, and the brim is labiated. In the center is placed an oval germen, which afterward becomes an obtuſe unilocular capſule, divided into four ſegments at the top, containing ſeveral ſmall ſeeds. The flower is of a bright blue colour, ſometimes inclining to a purple, or red, and often there are flowers of three colours on the ſame plant. The ſeeds of this plant ſhould be raiſed in hotbeds in the ſpring, and may in June be tranſplanted into the natural ground.

BROW, or EYE-BROW, the hairy arch extended over the orbit of each eye.

BROW-ANTLER, among ſportſmen, that branch of a deer's horn next his head.

BROW-POST, among builders, the beam that goes acroſs a building.

BROWN, among painters, dyers, &c. a duſky colour with a reddiſh caſt. There are a great variety or degrees of this colour, diſtinguiſhed by different appellations.

The principal brown colours known among painters are Spaniſh brown, brown pink, biſtre, brown okre, umbre, aſphaltum, and Spaniſh juice, or the extract of liquorice. See each under its proper article. But it muſt be remembered, that a brown colour of any tinct deſired may be procured by a judicious mixture of red, blue, and yellow.

BROWNISTS, in eccleſiaſtical hiſtory, a religious ſect that ſprung up in England towards the end of the ſixteenth century. Their leader was one Robert Brown, a native of Northampton. They ſeparated from the eſtabliſhed church on account of its diſcipline and form of government. They equally diſliked epiſcopacy and preſbyterianiſm. They condemned the ſolemn celebration of marriages in churches, maintaining that matrimony being a political contract, the confirmation of it ought to proceed from the civil magiſtrate. They rejected all forms of prayer, and held that the Lord's prayer was not to be recited as a prayer, being given only as a model, upon which to form our prayers.

BRUMALIA, in antiquity, were feſtivals of Bacchus, celebrated twice a year, the firſt on the twelfth of the calends of March, and the other on the eighteenth of the calends of November. They were inſtituted by Romulus, who during theſe feaſts uſed to entertain the ſenate.

BRUNIA, in botany, a genus of pentandrious plants, the flower of which conſiſts of five petals, with ſlender ungues the length of the calyx; it contains five capillary filaments, ſurrounding a ſmall germen crowned with a ſingle ſtyle, which is ſucceeded by a ſingle hairy ſeed.

BRUNSFELSIA, in botany, a pentandrious plant, which riſes with a woody ſtem to the height of eight or ten feet, ſending out many ſide branches, which are covered with a rough bark: theſe are furniſhed with oblong, oval, entire leaves. At the extremity of the branches the flowers come out, generally three or four together; theſe are monopetalous and funnel-ſhaped, with a long tube ſpreading open at the top, and divided into five ſegments. The fruit is a globoſe unilocular berry, containing a great number of roundiſh ſeeds, placed cloſe to the integument of the berry.

This plant grows naturally in moſt of the Weſt-Indian iſlands, where it is called the Trumpet-flower. It is propagated from ſeeds, but, being tender, requires a hot-houſe in this climate.

BRUTE, an animal without the uſe of reaſon, or that acts by mere inſtinct, in which ſenſe it implies much the ſame with beaſt, and comprehends all animals except the human ſpecies.

BRYONIA, bryony, in botany, a perennial plant, the ſtalks of which are long and ſlender, a little hairy, and climbing with tendrils like a vine. The leaves are angular, palmated, rough, and callous on both ſides; theſe are placed alternately on the ſtalks. The flowers proceed from the hollows where the leaves join to the ſtalk, and conſiſt each of a ſingle campaniform petal, divided into five roundiſh ſections, of a whitiſh green colour, marked with veins. Some of theſe flowers are male, which contain five ſtamina; the others are female, and have a deciduous empalement. Theſe contain an embryo, which turns into a ſpherical berry of the ſize of a pea; it is at firſt green, then turns red, and is full of a nauſeous juice, and contains a few oval ſeeds. The root of this plant is fleſhy, and grows

grows to a large size; these have been formerly, by impostors, brought into the resemblance of the human form, and carried about the country, and shewn for mandrakes. The method these people practised, was, to find a young thriving bryony plant; then they opened the earth all round the root, being careful not to disturb the lower fibres. Being prepared with a mould such as is used for casting plaster figures, they fixed the mould close to the root, fastening it with wire, to keep it in its proper situation; then they filled the earth about the root, and left it to grow to the shape of the mould, which in one summer it will do; so that if this be done in March, by September it will have the shape required.

The juice of bryony-root is so sharp as to eat into the skin; however, when they are dry, they lose a great part of their acrimony. It is a strong cathartic, and powerfully dissolves viscid humours, and carries them off by stool, and sometimes by vomiting. It has been used in madness, and some kinds of dropsies with success, as well as in asthmas, hysteric complaints, and even in palsies and epilepsies: the dried root, reduced to powder, is given from a scruple to a drachm; but the extract made by water is much the best and safest, because it works in a milder manner, and the dose is from half a drachm to a drachm. Externally, it is a powerful resolvent, and has been recommended against pains in the side; and some will have it almost infallible in arthritic pains and tumours, ordered in a cataplasm. The fresh root being bruised, and laid to the small of the back, has promoted urine, and cured the dropsy; for the hyp-gout it should be bruised, mixed with linseed-oil, and laid warm to the part afflicted. Bryony grows wild under hedges, and climbs upon the bushes, &c. In many parts of England it may be cultivated in gardens, by sowing the seeds in the spring of the year, in a dry, poor soil, where they will, in two years time, grow to be large roots.

Black BRYONY, in botany. See the article TAMUS.

Peruvian BRYONY. See the article JALAP.

BRYUM, in botany, a genus of mosses, consisting of a stalk furnished with leaves, which arise immediately from the root: on this stalk stands a separate pedicle, with a conic capsule on its top, covered with a smooth operculum, and containing a fine powder.

BUBALUS, the buffalo. See BUFFALO.

BUBBLE, in philosophy, a small drop, or vesicle of any fluid filled with air, and either formed on the surface of the fluid, as in rain, &c. or in its substance, by an internal motion of its component particles.

Bubbles are dilatable and compressible; that is, they take up more or less space, as the included air is more or less heated, or more or less pressed externally; because the included air acts equally in every direction. Their coat is formed of minute particles of the fluid, retained by the attraction between those particles.

BUBBLE, in commerce, a cant term given to a kind of projects for raising money on imaginary foundations, much practised in France and England in the years 1719, 1720, 1721.

BUBO, or BUBOE, in surgery, a tumour which arises, with inflammation, only in certain or particular parts to which they are proper, as in the arm-pits and in the groin. See the article TUMOUR.

The division of a bubo is generally two-fold, the benign and the malignant: a bubo is said to be benign, when it arises spontaneously, without any preceding contagious and pestilential disease, as they frequently do in infants: those are also of this kind which come after benign fevers, being a critical discharge of the disease, and therefore commonly termed pestilential or venereal buboes.

With regard to the causes of benign buboes, they take their rise from an inspissation and obstruction of the blood; so that they differ from other inflammations, only in the particular part where they are seated.

In buboes which are unaccompanied with any other disease, the frequent taking of some cathartic medicine, with an addition of mercurius dulcis, is found to be of great service; other medicines which attenuate the blood, should be also used. When the inflammation is so gentle, as to give hopes of dispersion, it may be proper to apply discutient plasters externally, as *emplast. diachyl. simplex. de spermate ceti, de galbano, &c.*

But if the inflammation proves more violent, the pains more intense, and the discutient plasters avail nothing, it will be proper to bring it to suppuration, by the application of emp. diachylon, cum gummis, or something as effectual. If violent pains also affect the patient, the frequent application of digesting cataplasms warm to the part, will not only mitigate the pain, but also greatly promote a dispersion, or else a digestion and maturation.

Pestilential BUBOES are distinguishable from other tumours, by their happening at a time, and in conjunction with the plague, and from their being accompanied, in the patient, with the symtpoms proper to that distemper: these tumours are sometimes joined with carbuncles.

It is not without reason affirmed by some of the more learned and modern physicians, that almost the whole business of curing the plague consisted in carefully promoting the eruption of buboes. The patient, upon the first appearance of the tumours, should keep the house, or rather keep in a warm bed, to be more secure from the air.

Venereal BUBO, a tumour with pain and inflam-

mation, arising in the groin or arm-pits, after contact with an impure woman who is afflicted with the venereal disease. The most certain signs of buboes being venereal are, the patient's having to do with these women, and from their being, and having been, accompanied with gonorrhæas, chancres, or other symptoms of the venereal disease. With regard to the cure, there are many physicians who hold, that the dispersion of venereal buboes are equally improper as in the pestilential; they therefore judge it necessary to abstain entirely from bleeding, purging, and to forward the tumour to suppuration as fast as possible: however, others are for taking cathartic and mercurial medicines, together with a decoction of the woods, and other purifiers of the blood. The dispersion is to be effected with large doses of mercurius dulcis, as is usual in carrying off gonorrhæas.

Externally to the tumour should be applied some discutient plasters, as those in the pestilential tumours: the patient should keep a regular diet and course of life, and should abstain from strong liquors.

The suppuration is to be promoted much in the same manner as mentioned in the benign and pestilential tumour.

The internal medicines should be a decoction of the woods, two or three times a day, from eight to twelve ounces at a time, with thirty or forty drops of essent. lignor. pimpinellæ, albæ fumariæ, &c. It is to be opened as the pestilential bubo.

BUBON, Macedonian parsley, in botany, a genus of umbelliferous plants. The common sort has a long, thick, white, wrinkled woody root, which sends forth a stalk to the height of a foot and a half: this is thick, hairy, and branched. The leaves resemble those of garden-parsley, but are more large, of a bright pale-green colour, and serrated on their edges. The flowers grow on the extremities of the branches in umbels; these are whitish, and are each composed of five lanceolated inflexed petals, with the same number of filaments, topped with simple antheræ. The germen, which is situated below the flower, supporting two bristly styles which are persistent, becomes afterwards an oval, striated, hairy fruit, separable into two parts, each containing an oval, aromatic seed, plane on one side, and on the other convex, striated, and hairy.

This plant grows wild in Macedonia, and was greatly valued by the antients. It is here cultivated in gardens, and propagated by sowing the seeds in light sandy earth in the month of April, and should be kept well watered in dry weather: being somewhat tender, it should be sheltered in winter in this climate. The seeds only are in use, and it has the same virtues as those of the common parsley, but stronger, and is one of the ingredients in Venice-treacle. Botanists enumerated three other species, two of which are natives of Africa, and the other grows naturally in Sicily.

BUBONOCELE, or Hernia Inguinalis, in surgery, a tumour in the inguen, formed by a prolapsus of the intestines, omentum, or both, through the processes of the peritonæum, and rings of the abdominal muscles.

The bubonocele may arise from two causes, viz. a relaxation of the peritonæum and rings of the abdominal muscles, or some violent contraction and pressure of the abdominal muscles upon the intestines, as in jumping, lifting of great weights, coughing, hollowing, blowing a trumpet, riding on horseback, a fall, &c.

When this disorder is formed insensibly, and by degrees, it is attended with but few and slight symptoms: when it arises from violent colds, exercises, eating too plentifully of gross and flatulent food, which will exasperate the disorder, the consequence will be violent pain and inflammation, sickness, vomiting, and the iliac passion. It may be farther discovered from the tumour occasioned thereby in the groin, which proceeds up to the ring of the abdominal muscles; and when the intestine is not incarcerated, but returnable into the abdomen, the tumour subsides upon lying down. When the bubonocele is incarcerated, so that the parts forming the tumour are not returnable into the abdomen, it usually appears with a greater resistance to the touch, redness, and inflammation.

These ruptures are often attended with danger, especially the incarcerated ones, in which, if the intestine be not timely returned, but the stricture continues two or three days, red and livid spots appear upon the tumour, which denote a sphacelus or mortification; and if an universal cold sweat seizes the patient, he has generally but a few hours to live. When the omentum alone falls down, there is less danger than when it is accompanied with the intestines.

When the intestine is returnable, the patient should be laid on his back, with his thigh a little bent, to relax the integuments; then the tumour is to be gently pressed, or returned with the hands and fingers, after which a plaster and compressure are to be applied to the part affected, and retained with a proper truss, and a girdle or bandage, without taking them off for several months, or longer, as there is occasion. See the article Truss.

When the intestine is not returnable, then the operation of incision becomes absolutely necessary, in order to dilate the parts. However, the surgeon may first try the repeated use of cataplasms, ointments, and laxative clysters, after bleeding; whereby the stricture is sometimes removed, and the intestine may be returned by the finger, without much difficulty.

BUCARDIA, or Bucarditæ, in natural history, a kind of figured stones, formed in the cavities

ties of the larger cockles, and thence neceſſarily reſembling, in ſome meaſure, a heart at cards.

BUCCAL, *Buccalis*, ſomething belonging to the cheeks: thus the buccal glands are thoſe diſperſed over the inner ſide of the cheeks.

BUCCANEERS, thoſe who dry and ſmoke fleſh or fiſh, after the manner of the Americans.

BUCCANEERS alſo ſignify thoſe famous adventurers of all the nations in Europe, who formerly joined together to make war againſt the Spaniards of America, cruizing about in privateers, and taking all the veſſels and ſmall craft they could meet with.

BUCCINA, an ancient muſical and military inſtrument. It is uſually taken for a kind of a trumpet, which opinion is confirmed by Feſtus, by his defining it a crooked horn, played on like a trumpet.

BUCCINATOR, in anatomy, a muſcle on each ſide of the face, common to the lips and cheeks. The origin of the buccinator is partly from the anterior and lower part of the coronoide proceſs of the lower jaw, and partly about the roots of the poſterior dentes molares of both jaws. Its progreſs, as the head is erect, is nearly horizontal; its termination is at the angle of the lips. Its uſes are to bring the food into the way of the teeth; and the ſalival duct of Steno perforates it in the middle.

BUCHNERA, in botany, a genus of plants, whoſe flower conſiſts of a monopyhllous calyx, divided into five parts, which is perſiſtent: the corolla is monopetalous, with five equal and obverſely cordated ſegments at its edge, containing four ſhort filaments, topped with oblong antheræ: the fruit is an ovato-oblong capſule, with two cells divided at the top, containing numerous angulated ſeeds.

BUCIDA, in botany, a genus of decandrious plants, whoſe flower is apetalous; the calyx is monophyllous and campanulated, cut into five ſegments, and perſiſtent; the fruit is a dry ovated berry, with one cell, containing an egg ſhaped ſingle ſeed.

BUCK, among ſportſmen, in his firſt year, is called a fawn; the ſecond, a pricket; the third, a ſorel; the fourth, a ſore; the fifth, a buck of the firſt head; and the ſixth, a great buck. This beaſt is common in moſt countries, being corpulent as a hart, but in ſize reſembling more a roe, except in colour; the males have horns, which they loſe yearly; the females none at all. As for the colour, it is very different; however, they are moſtly branded and ſandy, with a black liſt all along the back. Their fleſh is excellent nouriſhment.

BUCK-BEAN, in botany; ſee the article MENIANTHES.

BUCK-THORN, *Rhamnus*, in botany, a ſhrub which grows naturally in the hedges in divers parts of England. The root is long, hard, and woody, from which ariſes a ſtrong woody ſtalk, to the height of twelve or fourteen feet, ſending out many irregular branches, which are armed with thorns. The young ſhoots have a ſmooth grayiſh brown bark, but the older branches have a darker and rougher bark. The leaves ſtand upon long ſlender pedicles, and are of a yellowiſh green, about the ſize of thoſe of the ſloe-tree; theſe are ſlightly ſerrated on their edges, and have a pretty ſtrong midrib, with ſeveral veins proceeding from it, which diverge toward the ſides, but meet again near the point. The flowers are ſmall, of a greeniſh or yellowiſh colour, and come out in bunches from the ſides of the branches. Some plants produce male-flowers, and others female. The female-flowers conſiſt of a funnel-ſhaped petal, cut into four parts at the top; theſe are ſucceeded by pulpy berries of a roundiſh form, green at firſt, and black when ripe, yielding a bitter greeniſh black juice, and incloſing four hard ſeeds.

This plant flowers in June, and the berries are ripe toward the end of September. From the juice of theſe berries a water-colour is made, called by painters ſap-green, which is done by preſſing it out when ripe, and then evaporating it to a conſiſtence over a gentle fire, adding to it a little roach-alum, diſſolved in water. To give it a higher and more beautiful colour, it muſt be continued over the fire, till it comes to the conſiſtence of honey; then put in bladders, and hung up in a chimney, or any other hot place, till it becomes hard. When theſe berries are gathered in harveſt time, and ſteeped in alum-water, they will yield a yellow or ſaffron-coloured juice. In medicine, theſe berries prove a ſtrong cathartic: a ſyrup of them is the only preparation now in uſe, and is reckoned a good medicine to purge watery humours, and againſt the dropſy, jaundice, itch, and all manner of eruptions of the ſkin; a dram, or a dram and a half of the ripe berries is a doſe for removing the palſy, gout, and rheumatiſm. Of late years theſe berries have been mixed by the people who gather them, with berries of other plants and other virtues, ſuch as thoſe of the frangula, cornus fœmina, &c. ſo that when the ſyrup is made by perſons who have not ſkill enough to diſtinguiſh the berries, it is often ſo very bad, that two ounces of the ſyrup from one ſhop, will not purge ſo well as one from another, which has brought this medicine into diſrepute with many perſons: but the cheat may eaſily be detected by opening them, and obſerving the number of ſeeds in each; for theſe contain four ſeeds, the frangula two, and the cornus fœmina but one; alſo by rubbing the juice on white paper, which will ſtain it of a green colour.

BUCK-WHEAT, the Engliſh name of the fago pyrum of authors; it is cultivated in many parts of England, and is a great improvement to dry barren lands.

lands. The beſt ſeaſon for ſowing the ſeed is in May: one buſhel will ſow an acre. The ground ſhould be ploughed and dreſſed in the ſame manner as for barley; and, if the ſoil is not very lean, it will yield a very great increaſe, as fifty or ſixty buſhels upon an acre, and is excellent food for hogs, poultry, &c. The flour of it is very white, and makes a very good ſort of pancake, if mixed with a little wheat flour. The ſtraw is good fodder for cattle; and the grain, given to horſes among their oats, will make them thrive; but it muſt be broken in a mill; otherwiſe it is apt to paſs through the cattle whole.

It is commonly late in the ſeaſon before it is ripe; but there is no great danger of the ſeed's failing, nor of ſuffering by wet after it is mown: it muſt lie ſeveral days to dry, that the ſtalks, which are hard, may wither before it is houſed.

Buck-wheat is ſometimes ſown very thick, and ſuffered to grow until it is near flowering, and is then ploughed in, which makes a very good lay for wheat or rye: but ſome people eſteem it the better way to feed cattle with it, eſpecially milch-cows, which they ſay will cauſe them to give a great deal of milk, and make both the butter and cheeſe very good. This will alſo afford food for cattle in the drieſt time, when all other graſs is burned up.

BUCKING *of Cloth*, among bleachers, the firſt operation or ſtep towards whitening of cloth. See the article BLEACHING.

BUCKLE, a well known utenſil, made of divers ſorts of metals, as gold, ſilver, ſteel, braſs, &c.

BUCKLER, a piece of defenſive armour uſed by the ancients, and worn on the left arm.

Votive BUCKLERS, thoſe conſecrated to the gods, and hung up in their temples as an offering to the gods.

BUCKRAM, in commerce, a ſort of coarſe cloth made of hemp, gummed, calendered, and dyed of ſeveral colours.

BUCOLIC, in ancient poetry, a kind of rural poem, relating to ſhepherds and rural affairs. See PASTORAL.

The word is formed from the Greek, βυκολος, an herdſman.

BUD, among gardeners, implies that part of a ſeed which firſt begins to ſprout, or rather the leaves which firſt appear.

BUD is alſo uſed to ſignify the ſprout from whence the branch ariſes.

BUDDLE, in minerology, a name given by the Engliſh dreſſers of the ores of metals to a ſort of frame made to receive the ore after its firſt ſeparation from its groſſeſt foulneſs.

The ore is firſt beaten to powder in wooden troughs, thro' which there runs a continual ſtream of water, which carries off ſuch of it as is fine enough to paſs a grating, which is placed at one end of the trough; this falls into a long ſquare receiver of wood, called the launder: the heavieſt and pureſt of the ore falling at the head of the launder, is taken out ſeparately, and requires little more care or trouble; but the other parts, which ſpread over the middle and lower end of the launder, is thrown into the buddle, which is a long ſquare frame of boards, about four feet deep, ſix long, and three wide. In this there ſtands a man bare-footed, with a trambling ſhovel in his hand, to caſt up the ore about an inch thick upon a ſquare board placed before him as high as his middle; this is termed the buddle-head; and the man dexterouſly, with one edge of his ſhovel, cuts and divides it longways, in reſpect of himſelf, about half an inch aſunder, in theſe little cuts; the water, coming gently from an edge of an upper plain board, carries away the filth and lighter parts of the prepared ore firſt, and then the metalline part immediately after, all falling down into the buddle, where, with his bare feet, he ſtrokes it and ſmooths it, that the water and other heterogeneous matter may the ſooner paſs off from it.

When the buddle by this means grows full, the ore is taken out; that at the head part, being the fineſt and pureſt, is taken out ſeparate from the reſt, as from the launder. The reſt is again trampled in the ſame buddle; but the head, or as it is called, the forehead of this buddle, and of the launder, are mixed together, and carried to another buddle, and trampled as at firſt. The forehead of this laſt buddle, that is, that part of the ore which has fallen at the head, is carried to what they call a drawing buddle, whoſe difference from the reſt is only this, it has no tye, but only a plain ſloping board on which it is once more waſhed with the trambling ſhovel. Tin ore, when it is taken from this, is called black-tin; and this is found to be compleatly ready for the blowing-houſe. *Philoſ. Tranſ.* N° 69.

BUILDING-DISH, a ſmall, ſhallow veſſel for waſhing ores by the hand.

BUDGE-BARRELS, among engineers, ſmall barrels well hooped, with only one head; on the other end is nailed a piece of leather, to draw together upon ſtrings like a purſe. Their uſe is for carrying powder along with a gun or mortar, being leſs dangerous, and carried with more eaſe than whole barrels. They are likewiſe uſed on a battery of mortars, for holding meal powder.

BUFF, in commerce, a ſort of leather prepared from the ſkin of the buffalo, and dreſſed with oil after the manner of ſhammy. See SHAMMY.

BUFFALO, *Bubalus*, in zoology, an animal of the ox kind, with very large, crooked, and reſupinated horns.

It is equal to our largeſt oxen in ſize: the head is very large, the forehead remarkably broad, and the

the aſpect very fierce and terrible. The eyes are large and prominent, the ears long and patulous, the horns very thick but ſharp at the point: the neck is thick, and remarkably ſhort; the fleſh hangs very looſe under the throat: the body is more bulky in proportion than our bull, and the legs are thicker, but about equal in length. The colour is uſually a blackiſh grey; but in this particular there are great varieties.

The buffalo is a native of the Eaſt, but has been introduced into Italy, and ſome other parts of Europe; where it is kept as a beaſt of burden and draught.

BUFFET, a ſmall apartment ſeparated from the reſt of the room by ſlender wooden columns, glaſs doors, &c. for the diſpoſing china, glaſs, plate, &c.

BUFFOON, a droll, or mimic, who diverts the public by his pleaſantries and follies.

BUFO, the toad, in zoology. See TOAD.

BUFONITÆ, in natural hiſtory, a kind of extraneous foſſils, otherwiſe called lycodontes, or wolf's teeth. See LYCODONTES.

BUGLE, in botany. See the article BUGULA.

BUGLOSS, *Bugloſſum*, in botany, a plant which ſends forth ſtalks about a foot and a half high, which are round and beſet with ſtiff hairs; the leaves are oblong, rough, narrow, and of a bluiſh green colour, placed alternately on the extremities of the branches; the flowers which come out from the wings of the leaves, and are collected in ſmall heads, of a fine blue colour, each is monopetalous and funnel-ſhaped, in which are inſerted five ſhort filaments, topped with oblong antheræ; it contains four germina, which afterward becomes as many oblong blunt ſeeds, enveloped in the calyx, and the whole plant has much the appearance of borage. The flowers are in the number of thoſe that are ſaid to be cordial, and are proper to reſtrain the heat of blood; theſe may be uſed in the manner of tea.

This plant is propagated by ſowing its ſeeds either in ſpring or autumn in light ſandy earth, and afterward planted at the diſtance of two feet from each other in beds; they flower in June, and the ſeed is ripe in Auguſt.

Viper's BUGLOSS. See ECHIUM.

BUGULA, bugle, in botany, a genus of plants, producing didynamious flowers; the common ſort which grows naturally in woods and ſhady moiſt places in divers parts of England, has a ſlender fibrous white root, with roundiſh ſoft ſinuated leaves of a darkiſh green; it hath two kinds of ſtalks, one of which creep on the ground and takes root at the joints, while the other ariſe upright and quadrangular, with hair on the two oppoſite ſides, alternately from joint to joint; the flowers are produced in looſe ſpikes, and are monopetalous and ringent; the upper lip is ſmall, upright and bifid, and the under one large and trifid; the filaments are, two ſhort and two long, terminated with double antheræ; the calx is monophyllous and perſiſtent, divided into five parts, from whence the piſtil ariſes, and is fixed to the hinder part of the flower; this is attended with four embryoes, which turn to as many ſeeds, which are incloſed in the calyx.

This plant is greatly eſteemed as a vulnerary herb, and is uſed both internally and externally; it enters as an ingredient into the vulnerary decoctions, and recommended externally, applied to ulcers, and is ſaid to be good in the bloody-flux, and all ſorts of hæmorrhages.

This plant is alſo called *conſolida media*, or middle conſound, and with the other ſpecies of this genus (which are natives of foreign countries) is called by Linnæus, *adjuga*.

BUILDING, a fabric erected by art, either for devotion, magnificence, or conveniency.

BUILDING is alſo uſed to ſignify the art of conſtructing and raiſing an edifice; in which ſenſe it comprehends the expences, as well as the invention and execution of the deſign.

Three things are chiefly neceſſary to be conſidered in the art of building, namely, conveniency, firmneſs, and pleaſure: and theſe Sir Henry Wotton conſiders under two heads, the ſituation, and the work.

As to the ſituation, either that of the whole is to be conſidered, or that of its parts. In the firſt, regard muſt be had to the quality, temperature, and ſalubrity of the air; to the quality of the ſoil; to the conveniency of water, fuel, carriage, &c. and to the agreeableneſs of the proſpect.

As to the ſituation of the parts, the chief rooms, ſtudies, and libraries, ſhould lie towards the Eaſt; thoſe offices which require heat, as kitchens, brew-houſes, bake-houſes, and diſtallatories, towards the South; thoſe that require a cool, freſh air, as cellars, pantries, and granaries, to the North; as alſo galleries for paintings, muſæums, &c. which require a ſteady light.

The ancient Greeks and Romans generally ſituated the fronts of their houſes towards the South; but the modern Italians vary very much from this rule. And indeed it is abſolutely neceſſary to have regard to the country, each being obliged to provide againſt its own inconveniencies.

The ſituation being fixed on, the next thing to be conſidered is the work itſelf, under which come firſt the principal parts, and next the acceſſories or ornaments. To the principal parts belong the materials, and the form or diſpoſition.

As for the materials they are either ſtone, brick, mortar, &c. or wood, as fir, cypreſs; cedar for pillars for upright uſes; oak for ſummers, beams, and croſs-work, or for joining and connection.

As to the form and diſpoſition of a building, it is either ſimple or mixed.

The ſimple forms are either circular or angular.

The circular form is very commodious, and the moſt capacious of any, ſtrong, durable, and very beautiful; but is the moſt chargeable of all others, and much room is loſt by the bending of the walls, when it comes to be divided into apartments; beſides an ill diſtribution of the light, unleſs it be from the center of the roof. For theſe reaſons, the ancients employed this form only in their temples and amphitheatres, which had no need of compartitions.

As for angular forms, building neither loves many nor few angles. The triangle is condemned above all others, as wanting both capaciouſneſs and firmneſs, as alſo on account of its not being reſolvable, in the internal partitions, into any other figure than its own. Buildings with five, ſix, or more angles, are more fit for fortifications than civil edifices. The rectangle, therefore, is generally choſen, as being a medium between the triangle and the pentagon, &c. But then authors are in diſpute, whether the rectangle ſhould be an exact ſquare, or an oblong; and Sir H. Wotton prefers the oblong, provided the length exceeds not the breadth by more than one-third. As to mixed forms, partly circular, and partly angular, a judgment may be made of them, from what has been already ſaid of ſimple ones. Let the builder, however, remember not to loſe ſight of uniformity, while he is in purſuit of variety; for theſe two may be very well reconciled, as may be obſerved in our bodies, which are uniform in the whole configuration; and yet ſome of the members are round, others flat; ſome prominent, and others indented, or retired.

Some obſerve, that in building houſes long, the uſe of ſome rooms will be loſt; as they will take up more for entries and paſſages, and will require too much for doors; and if the building be a geometrical ſquare, the middle rooms will want light, in caſe the houſe be pretty large; and therefore they recommend the form of the letter H, a form, ſay they, in which the building ſtands firmer againſt the weather, and in which the offices may be remote from the parlour and rooms of entertainment, and yet in the ſame houſe.

This figure may ſerve very well for a country gentleman's houſe.

The principal parts of a building are comprized, by Baptiſta Alberti, under five heads, viz. the foundation, the walls, the apertures, the compartitions, and the covering; ſee each under its proper article, as FOUNDATION, &c.

The acceſſories or ornaments of a building are fetched from ſculpture and painting. In the firſt, care ought to be taken that there be not too much of it, eſpecially at the entrance; and that both in fine and coarſe pieces of ſculpture, and likewiſe in placing figures aloft, the rules of perſpective be ſtrictly obſerved.

In painting, the chief things to be regarded are, that the beſt pieces be placed in the beſt lights; and that they be ſuited to the intention of the rooms they are uſed in.

If we compare the modern with the old way of building in England, we cannot but wonder at the genius of thoſe times. Our fore-fathers were wont to dwell in houſes, moſt of them with a blind ſtair-caſe, low cielings, and dark windows; the rooms built at random, without any contrivance, and often with ſteps from one to another: whereas the genius of our times requires light ſtair-caſes, fine ſaſh-windows, and lofty cielings, with conveniencies far ſuperior to thoſe that houſes in ancient days afforded upon an equal quantity of ground.

Ship-BUILDING, the art of deſigning the figure, forming the ſeveral limbs, and conſtructing the body of a ſhip or veſſel. See NAVAL ARCHITECTURE.

In the article referred to, and to which this may be properly eſteemed a concluſion, the reader will find a general account of the riſe and progreſs of *Ship*-BUILDING, together with a comparative view of the art, as it has appeared amongſt the ancients and moderns: we likewiſe at that time ventured to cenſure the evident impropriety of pretending to eſtabliſh general rules of proportion, a maxim ſo often abſurdly adopted amongſt many of our modern *Ship*-BUILDERS, who for want of a native genius and taſte, and a ſufficient knowledge of the nature of phyſics, mathematics, ſolids, and fluids, were neceſſitated to purſue the ſervile mechanical methods handed down to them by their laborious preceptors: it ſhall be our preſent endeavour to ſpeak more particularly of the principal members that compoſe this complicated machine; in which we ſhall decline as much as poſſible to diſtract our reader's attention, by drawing him into a labyrinth of technical terms, from which we can neither extricate him nor ourſelves.

But it will be neceſſary on this occaſion to ſay ſomething of the different parts uſed in fabricating the ſhips of the ancients, previous to an explanation of modern ſhip-building.

The ignorance of the principal parts of their ſhipping has occaſioned many miſtakes and much confuſion in thoſe who have converſed with authors of antiquity. Herein we ſhall chiefly follow Scheffer, who hath ſo copiouſly treated this ſubject, and with ſuch induſtry and learning, collected whatever is neceſſary to illuſtrate it, that very little room is left for enlargement by thoſe who incline to purſue this inveſtigation.

The chief parts then, of which ſhips formerly conſiſted, were three, viz. the *belly*, the *prow*, and the *ſtern*: theſe were again compoſed of other ſmaller parts, which ſhall briefly be deſcribed in their order.

1. In the belly or middle part of the ſhip there

was

was τρόπις, *carina*, or the *keel*, which was compoſed of wood: it was placed at the bottom of the ſhip, being deſigned to cut and glide through the waves, and therefore was not broad, but narrow and ſharp; whence it may be perceived that not all ſhips, but only the μακραὶ, which ſhips of war were called, whoſe bellies were ſtraight, and of a ſmall circumference, were provided with keels, the reſt having uſually flat-bottoms. Round the outſide of the keel were fixed pieces of wood to prevent it from being damaged, when the ſhip was firſt launched into the water, or afterwards ſtruck on any rocks; theſe were called κελεύσματα, in Latin *cunci*.

Next to the keel was φάλκις, the pump-well or well-room, within which was contained the ἄντλια, or pump, through which water was conveyed out of the ſhip.

After this, there was δευτέρα τρόπις, or the ſecond keel, ſomewhat reſembling what is now called the kelſon; it was placed beneath the pump, and called λέσβιον, χαλκῆνη, κλειτοπόδιον: by ſome it is falſely ſuppoſed to be the ſame with φάλκις.

Above the pump was an hollow place, called by Herodotus κοίλη τῆς νηὸς, by Pollux κῦτος and γάστρα, becauſe large and capacious, after the form of a belly, by the Latins *teſtudo*. This was formed by crooked ribs, with which it was ſurrounded, which were pieces of wood riſing from the keel upwards, and called by Heſychius νομεῖς, and by others ἐλκοίδια, the belly of the ſhip being contained within them, in Latin *coſtæ*, and in Engliſh timbers: upon theſe were placed certain planks, which Ariſtophanes calls ἐντερωνείας, or ἐντερωνίδα.

Hence proceed we to the πλευραὶ, *latera*, or ſides of the ſhip, which encompaſſed all the former parts on both hands; theſe were compoſed of large rafters extended from prow to ſtern, and called ζωστῆρες, and ζωμιάματα, becauſe by them the whole fabric was begirt or ſurrounded.

In both theſe ſides the rowers had their places, called τοῖχοι, and ἑδώλια, in Latin *fori* and *tranſtra*, placed above one another: the loweſt was called θάλαμος, and thoſe that laboured therein θαλάμιοι; the middle ζυγὰ, and the men ζύγιοι; the uppermoſt θρᾶνοι, whence the rowers were termed θρανῖται. In theſe apartments were ſpaces through which the rowers put their oars; theſe were ſometimes one continued vacuity from one end to the other, called τράφηξ, but more uſually diſtinct holes, each of which was deſigned for a ſingle oar; theſe were ſtiled τρήματα, τρυπήματα, as alſo ὀφθαλμοὶ, becauſe not unlike the eyes of living creatures: all of them were by a more general name termed ἐγκωπα, from containing the oars; but ἐγκωπὶν ſeems to have been another thing, ſignifying the ſpaces between the banks of oars on each ſide, where the paſſengers ſeem to have been placed: on the top of all there was a paſſage or place to walk, called παρόδος, and παράθρανος, as joining to the θράνοι, or uppermoſt bank of oars.

2. Πρῶρα, the prow or fore-deck, whence it is ſometimes called μέτωπον, and commonly diſtinguiſhed by other metaphorical titles taken from human faces. In ſome ſhips there is mention of two prows, as alſo two ſterns; ſuch was Danaus's ſhip adorned by Minerva when he fled from Egypt. It was uſual to beautify the prow with gold and various ſorts of paint and colours: in the primitive times red was moſt in uſe, whence Homer's ſhips were commonly dignified with the titles of μιλτοπάρηοι, and φοινικοπάρηοι, or red-faced: the blue likewiſe or ſky-colour was frequently made uſe of, as bearing a near reſemblance to the colour of the ſea, whence we find ſhips called by Homer κυανόπρωροι, by Ariſtophanes κυανέμβολοι. Several other colours were alſo made uſe of; nor were they barely varniſhed over with them, but very often annealed by wax melted in the fire, ſo as neither the ſun, winds, nor water, were able to deface them. The art of doing this, was called from the wax κηρογραφία, from the fire ἐγκαυτικὴ, which is deſcribed by Vitruvius, and mentioned in Ovid.

Picta coloribus uſtis
Cæruleam matrem concava puppis habet.

The painted ſhip with melted wax anneal'd
Had *Tethys* for its deity.

In theſe colours the various forms of gods, animals, plants, &c. were uſually drawn, which were likewiſe often added as ornaments to other parts of the ſhips, as plainly appears from the ancient monuments preſented to the world by Bayſius.

The ſides of the prow were termed πτερὰ, or wings, and πάρια, according to Scheffer, or rather παρειαὶ; for ſince the prow is commonly compared to an human face, it will naturally follow that the ſides ſhould be called cheeks; theſe are now called bows by our mariners.

3. Πρύμνη, the hind-deck or poop, ſometimes called ἐρᾶ, the tail, becauſe the hindmoſt part of the ſhip: it was of a figure more inclining to round than the prow, the extremity of which was ſharp, that it might cut the waters; it was alſo built higher than the prow, and was the place where the pilot ſat to ſteer, the outer-bending part of it was called ἐπισεῖον, anſwering to our term, quarter.

They had various ornaments of ſculpture on the prow; as helmets, animals, triumphal wreaths, &c. the ſtern was more particularly adorned with wings, ſhields, &c. Sometimes a little maſt was erected whereon to hang ribbands of divers colours, which ſerved inſtead of a flag to diſtinguiſh the ſhip, and a weather-cock to ſignify the part from whence the wind blew. See COLOURS, FLAG, SIGNAL.

On the extremity of the prow was placed a round

piece of wood, called the πτυχὶς, from its bending; and ſometimes ὀφαθλμὸς, the eye of the ſhip, becauſe fixed in the fore-deck; on this was inſcribed the name of the ſhip, which was uſually taken from the figure painted on the flag. Hence comes the frequent mention of ſhips called *Pegaſi*, *Scylæ*, *Bulls*, *Rams*, *Tigers*, &c. which the poets took the liberty to repreſent as living creatures that tranſported their riders from one country to another. See the article SEA-FIGHT.

The whole fabric being compleated, it was fortified with pitch, and ſometimes a mixture of roſin, to ſecure the wood from the waters; whence it comes that Homer's ſhips are every where mentioned with the epithet of μέλαιναι, or black. The firſt that made uſe of pitch were the inhabitants of Phaeacia, ſince called Corſica: ſometimes wax was employed in the ſame uſe, whence Ovid,

Caerula ceratas accipit unda rates.

The azure waves receive the waxy ſhips.

After all, the ſhip being bedecked with garlands and flowers, the mariners alſo adorned with crowns, ſhe was launched into the ſea with loud acclamations and other expreſſions of joy; and being purified by a prieſt with a lighted torch, an egg and brimſtone, or after ſome other manner, was conſecrated to the god whoſe image ſhe bore.

With regard to modern *Ship*-BUILDING, it is neceſſary to obſerve here, that the art is ſo complicated, extenſive and various, comprehending ſuch a diverſity of ſtructures, that to treat the ſubject at large with perſpicuity and preciſion would fill a large volume of itſelf, and therefore would greatly exceed our bounds; and being thus neceſſitated to contract our deſcription, we cannot treat particularly of all the pieces that compoſe a ſhip. It ſeems neceſſary, however, to ſay ſomething of the principal pieces: we have therefore laid down each piece ſeparately, Plate XXIV, by which means the length of the ſcarphs are deſcribed, and the manner in which they are to be joined together.

EXPLANATION of PLATE XXIV.

A. The keel, in four pieces, to be firmly bolted together and clinched.

I. The fore-foot, one end of which is ſcarfed to the fore-end of the keel, of which it is a part, and the other end makes a part of the ſtem, to which it is ſcarfed.

u u. Two pieces of dead-wood, one afore and the other abaft, fayed upon the keel.

Note, *The term afore arrived too late for the preſs in this Dictionary: it means further, forward, or nearer the ſtern, and is the oppoſite term to abaft*; which ſee.

C C. The ſtem in two pieces to be ſcarfed together: it is the circular piece of timber where both the ſides of the ſhip unite forward.

E E. The apron, in two pieces, to be ſcarfed together, and fayed on the inſide of the ſtem, to ſupport the ſcarf of the ſtem; for which purpoſe the ſcarf of the apron muſt be clear from that of the ſtem.

o. The ſtemſon in two pieces, to ſupport the ſcarf of the apron.

o. The falſe poſt, which is fayed to the fore-part of the ſtern-poſt. Faying is fitting two pieces of wood, ſo as that one may be joined to the back, or inſide of the other, ſo as to lie cloſe.

B. The ſtern-poſt: it is tenanted into the keel, to which it is faſtened with a knee; and is that ſtraight piece of timber at the after-end of the ſhip, into which both the ſides are united.

D. The back of the poſt, which is likewiſe tenanted into the keel, and ſecurely bolted to the ſtern-poſt; the deſign of it is to give ſufficient breadth to the poſt, which ſeldom can be procured of a ſufficient breadth in one piece.

F. The knee which faſtens the poſt to the keel.

N. The wing-tranſom. It is fayed acroſs the ſtern-poſt, and bolted to the head of it: the faſhion-pieces are faſtened to the end of it; under this and parallel to it is the deck tranſom.

O O. Two tranſoms faſtened to the ſtern-poſt and faſhion-pieces, in the ſame manner as the wing-tranſom.

P. The tranſom-knee which faſteneth it to the ſhip's ſide.

Q. The faſhion-piece, of which there is one on each ſide: their heels are faſtened to the ſtern-poſt, at the height of the floor-ribbands, and their heads are faſtened to the wing-tranſom.

T. A floor-timber: it is layed acroſs the keel, to which it is faſtened by a bolt through the middle.

T T T T T. 2d, 3d, 4th futtocks and top-timbers. Theſe ſhew the proper length and ſcarf of the timbers, in what is called the midſhip-frame, which is a plane comprehended between the two ſides, at their extreme breadth, and the keel to which it is perpendicular; ſo that if a ſhip were cut through perpendicular to her length, and at her greateſt breadth, the exterior and interior part of both ſides from the upper-parts or edges, called the gunnels, down to the keel, would exhibit the midſhip-frame. The futtocks are to be joined, to complete a frame of timbers.

U U. Riders: theſe are fayed on the inſide of the ſhip acroſs the keel, and ſtand in the ſame manner as the timbers, and conſiſt of floor and futtock riders.

Z. The kelſon: this is made of two or three large pieces of timber ſcarfed together in the ſame manner as the keel. It is placed over the middle of the

the floor-timbers, and ſcored about an inch and a half down upon each of them.

R, S. Breaſt-hooks: theſe are fayed on the inſide acroſs to the ſtem, and to the bow on each ſide of it, to which they are faſtened with proper bolts. There are generally four or five in the form of an R in the hold, one in the form of S, into which the lower-deck planks are rabbitted; there is one right under the hawſe-holes, and another under the ſecond deck.

X, Y, X. Are thick planks which are fayed to the inſide, and ſtretch fore and aft, or from one end of the ſhip to the other, to ſupport the ſcarfing of the timbers.

Z. Are thick planks in the inſide called clamps, which ſuſtain the ends of the beams.

15, 15, 15, 15, 15. Are the wales: they are planks broader and thicker than the reſt, which are faſtened to the outſide of the ſhip on a line with the decks: with regard to the planks reaching from the wale upwards to the top of the ſide, and downwards to the keel, the reader is referred to the ſection of one half of the midſhip frame, as laid down in the plate.

d, d, d, d, d, d, d. Are knees. Theſe are crooked pieces of timber conſiſting of two arms, which form an angle ſometimes acute and ſometimes obtuſe or rectangular: their uſe is to faſten any two pieces together; as the beams to the ſhip's ſide, &c.

19. The rudder: this is joined to the ſtern-poſt by the rudder-irons, upon which it turns round in the googings, which are faſtened upon the ſtern-poſt for that purpoſe. There is a mortiſe cut through the head of it, into which a long bar is fitted, called the tiller, by which the rudder is turned from one ſide to the other, and both parts together, are called the helm.

23. The cat-heads. Theſe are two large ſquare pieces of timber, one on each ſide of the bowſprit: they project from the bow over the ſide, in order to keep the anchor clear of the ſhip, which is drawn up by a rope called the cat-fall, which paſſes through certain pullies, called ſheaves, in the outer-end of the cat-head: their inner-ends are faſtened upon the fore-caſtle.

m, m, i, i, i. Are the ſeveral pieces which compoſe the knee of the head, called by ſeamen the cut-water; the lower-part *m* is fayed to the ſtem, the keel of it is ſcarfed to the head of the fore-foot; it is faſtened to the bows by two knees, called cheeks, and to the ſtem by a knee called a ſtandard in the form of a K.

a, X, Y. Are beams, or large pieces of timber which ſupport the planks of each deck. See the article BEAMS. The reader will readily diſcover that the two ſides of the midſhip-frame in the middle of the plate are ſo diſpoſed, that all the pieces on one ſide may be ſeen before they are joined, and on the other after they are fixed in their proper places.

In ſhips of war the general dimenſions are eſtabliſhed by the authority of thoſe appointed by the government for that purpoſe. In the merchants ſervice, the extreme breadth, length of the keel, depth in the hold, and height in the waſte, and between decks; and ſometimes the height and breadth of the wing-tranſom, are agreed on by contract: and from theſe dimenſions the builder is to form a draught ſuitable to the trade for which ſhe is deſigned.

The firſt thing to be done, in order to lay down the deſign of a ſhip of war, is to determine the length, which ſhould be either on the lower-gun deck, or at the load-water-line: water-lines are deſcribed lengthways on a ſhip's bottom by the ſurface of the water in which ſhe ſwims; that which determines how much ſhe is under water when laden, is called the load-water-line, which is commonly at, or a little below her extreme length: there muſt be great care that ſufficient room be left between the ports.

The next thing is to eſtabliſh the breadth by the midſhip-beam; although ſome builders are divided in their opinion, about proportioning this to the length, yet moſt of them conform to dimenſions of ſhips of the ſame rate. After theſe two dimenſions are determined, the depth of the hold muſt be fixed, which in moſt ſhips is half the breadth; but the form of the body ſhould be conſidered; for a flat floor will require leſs hold than a ſharp one. The diſtances between the decks muſt alſo be determined.

We may then proceed to fix the length of the keel, which will oblige us to eſtabliſh the rake of the ſtem and ſtern-poſt: rake is the difference between a ſhip's lengths at the keel and upper-deck, or the line on which ſhe gradually projects farther out with the ſtem and ſtern as the fabric riſes. The height of the ſtem and wing-tranſom muſt alſo be fixed.

After theſe dimenſions are ſettled, the timbers may be conſidered which form the ſides of the ſhip. A frame of timbers, which appears to be one continued timber, is compoſed of one floor-timber, two or three futtocks, and a top-timber on each ſide: all theſe being united and ſecured by croſs-bars, form a circular incloſure; that which incloſes the greateſt ſpace is called the midſhip-frame: the curve of this frame is inverted at the lower part, ſo that the floor-timber will be ſomewhat hollow in the middle, whereby the ends will form a very obtuſe angle; but this angle decreaſes, the farther the frames are removed from the midſhips, in ſuch a manner, that the foremoſt and aftmoſt will become very ſharp, and form a very acute angle. Floor-timbers of this kind are called crutches.

Builders differ much in determining the ſtation of the midſhip-frame, ſome placing it before, and others at the middle of the ſhip. Thoſe who place

it before alledge, that if a ſhip is full forward, ſhe will meet with no reſiſtance after ſhe has once opened a column of water, and that the water ſo diſplaced will eaſily unite abaft, and by that means force the ſhip forward, and have more power on the rudder, the farther it is from the center of gravity; and beſides this, comes neareſt the form of fiſhes, which ſhould ſeem to be the moſt advantageous for dividing fluids.

When the riſing of the midſhip floor-timber is agreed on, we may then proceed to decide the riſing-line of the floor abaft on the ſtern-poſt, and afore on the ſtem.

The height of the lower-deck is the next thing to be conſidered: it is determined in midſhips by the depth of the hold; and ſome builders make it no higher than the ſtem, but they raiſe it more than it is in the midſhips, by as much as the load-water-mark abaft exceeds that afore. As to the height between decks, it is altogether arbitrary, and muſt be determined by the rate of the ſhip, and the ſervice ſhe is deſigned for.

We come now to conſider the upper-work, or all that is above water, called the dead work; and here the ſhip muſt be narrower; ſo that all the weight, lying above the load-water-line, will thereby be brought nearer the middle of the ſhip; by which means ſhe will ſtrain leſs by working the guns, &c. But though theſe advantages are gained by narrowing a ſhip above water, great care muſt be taken not to narrow her too much, for there muſt be ſufficient room upon the upper-deck for the guns to recoil. The ſecurity of the maſts ſhould likewiſe be remembered, which requires ſufficient breadth to ſpread the ſhrouds, although this may be in ſome meaſure ſupplied by enlarging the breadth of the channels which ſpread them.

In the article NAVAL *Architecture*, we occaſionally mentioned ſeveral eſſential qualities which ought to be united in a ſhip; and we ſhall here briefly deſcribe the manner in which this may be executed.

To make a ſhip carry a good ſail. A flat floor-timber, and ſomewhat long, or the lower-futtock pretty round, a ſtraight upper-futtock, the top-timber to throw the breadth out aloft; at any rate to carry her main breadth as high as the lower-deck. Now if the rigging be well adapted to ſuch a body, and the upper-works lightened as much as poſſible, ſo that they all concur to lower the center of gravity, there will be no room to doubt of her carrying a good ſail.

To make a ſhip ſteer well, and anſwer the helm quickly. If the faſhion-pieces be well formed, the tuck, or ſpreading-parts under the ſtern carried pretty high, the midſhip-frame well forward, a conſiderable difference in the draught of water abaft more than afore, a great rake forward and none abaft, a ſnug quarter-deck and fore-caſtle; all theſe will make a ſhip ſteer well. A ſhip which ſails well, will certainly ſteer well.

To make a ſhip carry her guns well out of the water. A long floor timber, and not of great riſing; a very full midſhip-frame, and low tuck, with light upper-works.

To make a ſhip go ſmoothly through the water without pitching hard. A long keel, a long floor, not to riſe too high afore and abaft; but the area or ſpace continued in the fore-body, according to the reſpective weights they are to carry; all theſe are neceſſary to make a ſhip go ſmoothly through the water.

To make a ſhip keep a good wind, and drive little to the leeward. A good length by the keel; not too broad, but pretty deep in the hold, which will occaſion her to have a ſhort floor-timber, and a great riſing.

As ſuch a ſhip will meet with great reſiſtance in the water going over the broadſide, and little when going a-head, ſhe will not fall much to the leeward.

Now ſome builders imagine it is impoſſible to make a ſhip carry her guns well, bear a good ſail, and be a prime ſailer; becauſe it would require a very full bottom to gain the firſt two qualities, whereas a ſharp ſhip will anſwer better for the latter; but when it is conſidered that a full ſhip will carry a great deal more ſail than a ſharp one, a good artiſt may ſo form the body, as to have all theſe three good qualities, and alſo ſteer well. After what has been ſaid on this, it certainly cannot be thought impoſſible to unite all theſe different qualities in one ſhip: giving the water a proper curve, ought likewiſe to be conſidered, upon which the beauty and ſtateline of a ſhip greatly depend; ſince it is this which makes a ſhip look airy and graceful in the water. There is no certain rule for laying them down; this is left entirely to the fancy and taſte of the artiſt, which, as we have more than once obſerved, is not often of the moſt delicate degree, or corrected by truth and judgment; witneſs the barbarous and unnatural mixture of Gothic and Chineſe ornaments, "clumſy heroes and fat-headed gods," on the ſame ſhip, the monſtrous iſſue of a ſavage conception and an aukward genius, as deformed and aukward as their own cant-timbers. See the article CARVED-WORK, where we ſhall exhibit a further proof of this.

We refer ſuch readers as wiſh to be more fully or particularly informed of Ship Building to M. Du Hamel's curious and uſeful Elements of Naval Architecture, to which we acknowledge ourſelves greatly indebted for the above deſcription. Mr. Mungo Murray has alſo publiſhed a book on this ſubject, called a Treatiſe on Ship-Building, &c. which muſt be of great ſervice to the younger artificers of this profeſſion, as it contains variety of very accurate drawings

drawings of ſhips. An abridgment of M. Du Hamel's book, referred to above, is alſo tranſlated, and annexed to Murray's Treatiſe.

BUL, in the Hebrew chronology, the eighth month of the eccleſiaſtical, and the ſecond of the civil year; the modern Jews call it Morſhevan, and it nearly anſwers to our month of October.

BULB, or BULBOUS ROOT, among gardeners, ſignifies a root of a roundiſh form, and commonly furniſhed with fibres at its baſe. An uniform bulb, is when it is compoſed of the ſame matter throughout, without any lines intervening; a truncated bulb conſiſts of many coats ſurrounding each other, as in the narciſſus, tulip, onion, &c. a ſquamous bulb conſiſts of many ſcales laying over each other like the tiles on a houſe, or the ſcales of fiſhes, as the roots of the lilly, martagon, &c.

BULBOCASTANUM, in botany. See BUNIUM.

BULBOCODIUM, in botany, a genus of plants, producing hexapetalous funnel-ſhaped flowers. One of the ſpecies which grows naturally on the Alps, hath a ſmall bulbous root, covered with a rough hairy ſkin, from which iſſues forth a few long narrow leaves; from the middle of theſe comes forth the flower, which is erect, and ſtands on the top of the footſtalk, which riſes about three inches high, and hath four or five narrow leaves placed alternately upon it below the flower. This plant flowers in March, and the ſeeds are ripe in May. The whole plant has much the appearance of the ſaffron, or crocus, and is propagated in the ſame manner.

BULGARIANS, a ſect of heretics, who, among other errors, held that men ought to believe no Scripture but the New Teſtament; that baptiſm was not neceſſary to infants; that huſbands who converſed with their wives could not be ſaved; and that an oath was abſolutely unlawful.

BULIMY, among phyſicians, a diſeaſe in which the patient is affected with an inſatiable deſire of eating, and unleſs indulged, often falls into fainting fits.

BULK-HEADS, in naval architecture, certain partitions built up in different places of a ſhip, either acroſs or lengthwiſe, to form and ſeparate the various apartments.

BULL, *Taurus*, in zoology, the male of the ox kind. See the article BOS.

BULL, *Taurus*, in aſtronomy. See the article TAURUS.

BULL's-EYE, in aſtronomy; ſee ALDEBARAN.

BULL's-EYE, in the marine, a ſort of ſmall pulley in the form of a ring, round whoſe outer-edge, which is made concave for that purpoſe, a rope is fitted, and ſpliced cloſe about it: it is uſed to paſs a rope through when it is required to haul the rope tight above and below, as the bowline-bridle, upon which the bull's-eye ſlide up and down occaſionally: this is more frequent amongſt the Dutch than Engliſh.

BULL-FINCH, in ornithology, the Engliſh name of the loxia with a black head, and red breaſt. It is about the ſize of a common ſparrow; and its wings are elegantly variegated with black and red.

BULL-FROG, the largeſt kind of frog. See RANA.

BULL, among eccleſiaſtical writers, implies a written letter, diſpatched by order of the pope, from the Roman chancery, and ſealed with lead. It is written on parchment, by which it is diſtinguiſhed from a brief.

Golden BULL, an edict or imperial conſtitution, made by the emperor Charles IV. and eſteemed as the Magna Charta, or fundamental law of the German empire.

It is dignified with the epithet golden, from its having a golden ſeal appended to it with cords of red and yellow ſilk. On one ſide of this ſeal the emperor is repreſented as ſitting on his throne, and on the other the capitol of Rome. The original of this edict, which is in Latin, and written on vellum, is preſerved at Franckfort.

BULLACE-TREE, in botany, a wild plumb growing in hedges in many parts of England. There are two ſorts, the black and the white bullace, which are rarely cultivated in gardens: for their generical characters, ſee the article PRUNUS, of which they are a ſpecies.

BULLET, a leaden or iron ball or ſhot, wherewith fire-arms are charged; they are of various ſorts and dimenſions. See the article BALL and SHOT.

It is demonſtrated in the Elements of Geometry, that ſimilar ſolids are to each other, as the cubes of their homologous, or correſpondent ſides or diameters: bullets are ſimilar ſolids, and therefore they are to one another as the cubes of their diameters. If we ſuppoſe the weight and diameter of a bullet to be known by experiment; for example, if it is found that a bullet of four pounds weight is three inches in diameter, the weight of any bullet may be eaſily found, if its diameter be given, and the diameter of any bullet, if the weight be given.

Let it be ſuppoſed, for inſtance, that the weight of a bullet of five inches diameter is required; this will be found by the Rule of Three, by ſaying, As the cube of 3, which is 27, is to the cube of 5, which is 125, ſo is four pounds to the fourth term, or the weight required; or 27 : 125 :: 4 : the fourth term, which will appear to be eighteen pounds and a half, the weight of a bullet of five inches diameter: by the ſame rule the diameter of bullets may be found, whoſe weight are given; for the Rule of Three having produced the fourth term, or the cube of the diameter required, the diameter ſought will appear, by extracting the cube root from it.

Red-

of white lillies, of henbane, &c. with theſe the part affected ſhould be frequently anointed. The vulgar method of applying the burnt part to a candle, or the fire, and keeping it in that poſition as long as you can bear it, repeating this proceſs till all ſort of heat and pain is removed, is frequently attended with ſucceſs. The injured part may be fomented with water, as hot as the patient can bear it, till the pain and heat entirely diſappear.

When the burn is of the ſecond degree, which is attended with a bliſter, it ſeems improper to open the veſicle, or cut the ſkin already lacerated; but the beſt method, in this caſe, is, with all the haſte poſſible, to apply one or other of the medicines preſcribed in the firſt degree, and renewing it very frequently: if the pain continues, lenitive remedies are to be uſed; here the moſt eligible medicines are the linſeed oil, Mynſicht's ointment, unguentum nutritum, &c. With theſe the part muſt be often anointed; or they muſt be ſpread on linen, and bound to the part affected: as the pain and heat gradually decreaſe, ſome plaſter, as that of red lead, may be applied, in order to ſmooth and reſtore the ſkin. If this ſecond degree be more intenſe than ordinary, and affects a great part of the body, it will be neceſſary forthwith to take away ſome blood, in proportion to the violence of the burn, even till the patient faints, in order to prevent exulcerations, deformities by ſeams, and perhaps a gangrene: after which a ſtrong cathartic ſhould be uſed.

As to the third degree, in which a cruſt immediately covers the burnt part, it is very difficult, if not abſolutely impoſſible to cure it, without a ſuppuration. When this happens in the face, all diligence ſhould be uſed to prevent deformity, which may be occaſioned by a large cicatrix; therefore, in this caſe, the uſe of all plaſters and ointments whatſoever is to be avoided: but you cannot be too ſolicitous in forwarding the caſting off of the eſchar, or cruſt, and the evacuation of the matter that is concealed under it; yet it ſhould not be torn away with the knife, nor ſeparated with the hands: the eaſieſt and moſt ſucceſsful method is by the uſe of emollients, ſuch as have been mentioned already, applied warm, and repeated till the hard cruſts ſeparate from the live fleſh; that part ſhould be dreſſed two or three times a day, and at each dreſſing, if you ſhould obſerve any portion of the cruſt tending to a ſeparation from the reſt, it ſhould be removed with the forceps, and the remaining cruſt anointed with butter, at the ſame time never neglecting the uſe of fomentations. The cruſt being taken off, the wound muſt be cleanſed and healed, the firſt of which offices may be executed by any mild digeſtive ointment, mixed up with mel roſarum: the medicines uſed for healing are principally unguentum diapompholygos, vel de lithargyrio, &c. but if any portion of the eſchar is left under theſe ointments and plaſters, a danger follows of making a deformed cicatrix, from the conſtriction of the neighbouring parts, and from the acrimony of the confined ſanies. Evacuations by bleeding and purging are always to be premiſed, and proper regulations, with regard to diet, muſt be complied with: the beſt method of encouraging the renovation of the ſkin, is by frequently holding the burnt part over the ſteam that riſes from boiling water. But as to the fourth degree, which is always attended with extreme danger, where the burning has penetrated to ſuch a depth as to corrupt and mortify all before it, almoſt to the very bone, all remedies are vain and uſeleſs, and there is no other way of aſſiſting the patient, but by cutting off the affected limb, as is done in a ſphacelus.

BURNET, the Engliſh name of a plant called pimpinella by Linnæus, and tragoſelinum by Tournefort.

It is a native of this country, and promiſes very great advantages as a green ſucculent food for cattle during the winter months; and the judicious Mr. Rocque, on obſerving that burnet retains its verdure amidſt all the inclemencies of that ſeaſon, reſolved to try the effect of giving it a good culture. He has ſucceeded therein to his utmoſt wiſh; and the plant bids fair to be of ſingular utility, where flocks of ſheep are kept, becauſe, as it preſerves all its leaves unhurt by froſt, the farmer may thereby have a conſtant ſtock of green food for his ewes and lambs, at a time when turnips and every other ſucculent plant may fail him.

In deſcribing this plant, Mr. Miller diſtinguiſhes ſeven different ſpecies of it; but only three, or perhaps rather but two, of them ſeem to be the ſorts proper to be cultivated for the food of cattle. Theſe are; 1. The tragoſelinum majus, umbella candida, greater burnet ſaxifrage, with a white umbel. 2. Tragoſelinum alterum majus, another greater burnet ſaxifrage; and 3. The tragoſelinum minus, or leſſer burnet ſaxifrage. All theſe are equally hardy plants, and natives of this iſland: but the largeſt ſorts promiſe the greateſt quantity of fodder, and therefore ſhould, probably, be preferred by the huſbandman. A fourth ſort, which Mr. Miller mentions by the title of tragoſelinum radice nigra Germanicum, German burnet ſaxifrage with a black root, will probably anſwer as well in its native country, Germany, as ours will here: and I therefore recommend the trying of it there; as I do to other countries, the cultivating of their native ſpecies of this plant, in full confidence that they will find it anſwer greatly for the winter green food of their cattle. Experience has proved that all countries are benefited by the introduction of foreign plants, as particularly the lucerne, ſaintfoin, &c. I therefore take this opportunity of recommending a trial of the German burnet here, and of ours in Germany and elſewhere.

The

The firſt of the above-mentioned ſpecies of burnet grows naturally in woods, and on the ſides of banks near hedges, in ſeveral parts of England. The lower leaves of this ſort are winged, and compoſed of three pair of heart-ſhaped lobes, terminated by an odd one: they are ſharply ſawed on their edges, and ſit cloſe to the mid-rib. The lower lobes, which are the largeſt, are near two inches long, and one and a half broad at their baſe, and are of a dark green. The ſtalks grow more than a foot high, dividing into four or five branches; the lower part of the ſtalk is garniſhed with winged leaves, ſhaped like thoſe at the bottom, but ſmaller; thoſe upon the branches are ſhort and trifid; and the branches are terminated by ſmall umbels of white flowers, which are compoſed of ſmaller umbels or rays. The flowers have five heart-ſhaped petals, which turn inward, and are ſucceeded by two narrow, oblong, channelled ſeeds. It flowers in July, and the ſeeds ripen in autumn. A variety of this with red flowers is frequently found among the other, and riſes from the ſame ſeed.

The ſecond ſort grows naturally in dry paſtures in many parts of this iſland. The lower leaves of this are compoſed of four pair of lobes, terminated by an odd one; theſe are roundiſh; thoſe on the lower part of the leaf are about half an inch long, and the ſame in breadth: they are indented on their edges. The ſtalks riſe near a foot high, and ſend out three or four ſlender branches, which are garniſhed with very narrow leaves. The umbels of the flowers of this are ſmaller than thoſe of the former ſort, as are alſo the flowers and ſeeds, which blow and ripen about the ſame time.

The third, or ſmaller ſort of burnet, grows naturally in dry gravelly paſtures in ſeveral parts of this country. Its lower leaves have five or ſix pair of lobes terminated by an odd one, and are deeply cut almoſt to their mid-rib, in form of wings. The ſtalks are ſlender, and riſe about a foot high, ſending out a few branches, which have a narrow trifid leaf placed at each joint, and are terminated by ſmall umbels of white flowers, compoſed of ſeveral rays ſtanding upon pretty long foot-ſtalks. The flowers of this ſort appear, and its ſeeds ripen, at the ſame time as thoſe of the former; but they are ſmaller.

In the meadows about Windſor, half the graſs is burnet. Mr. Rocque has experienced, that it will grow in the drieſt land: for he has planted ſome of it even in the gravel walks in his garden, where every thing elſe is burnt up in the ſummer, but this never withers; one of the qualities of burnet being to continue in ſap all the year. It is the opinion of many who have ſeen the burnet of his raiſing, that if this plant is generally cultivated, there will never be a ſcarcity of hay in England, even in the greateſt drought.

The land on which it is ſown ſhould be in fine tilth, and free from weeds, eſpecially couch-graſs, which is here the moſt hurtful of all. A drag, that is to ſay, ſuch a fork as the gardeners clean their aſparagus with, is the beſt inſtrument for extirpating this weed. The dragging of an acre thus will coſt ſix or ſeven ſhillings. If the land is poor, it ſhould be dunged, and laid down very ſmooth. The ſeed may be covered with a very light harrow, for it will not bear to be buried very deep, and the ground ſhould then be rolled, that it may be ſmooth for mowing. It may be ſown at any time between April and September.

Ten pounds of burnet-ſeed may do for an acre of land: but twelve, fourteen, or even ſixteen pounds will be better; becauſe, when burnet is thin, the plants grow ſo large, that the hay made of them is coarſe. Theſe will riſe in eight or nine days after the ſowing. If great numbers of weeds come up with them, it will be leſs chargeable to let thoſe weeds grow with the burnet, till it is about five or ſix inches high, than to weed or hoe it. The whole may then be mowed, and gathered clean off; and the quick growth of the burnet afterwards will choak all other weeds. The heart of the burnet being almoſt within the ground, the ſcythe cannot hurt it.

If the burnet does not grow equally every where, ſome plants muſt be drawn where they are too thick, and planted where they are thinneſt: or the vacant ſpaces may be ſupplied from the nurſery. If the land was not got in good order to ſow the ſeeds at a proper ſeaſon, the burnet may be tranſplanted at Michaelmas from this nurſery, and ſet at nine or twelve inches diſtance every way, according to the richneſs of the ſoil.

The ſeed ſown in May may be mowed at the latter end of July. That ſown in June will yield a pretty good crop, and muſt be cut but once; and the ſame of that which is ſown in July. The plants produced by the ſeeds ſown in Auguſt ſhould be mowed, to deſtroy the weeds. Theſe mowings may either be given green to horſes, or be made into hay. The firſt ſpring cutting will purge horſes; and Mr. Rocque believes it will alſo cure the greaſe: but it is only the firſt crop that purges.

Burnet ſhould be mowed but once the firſt year, in order to leave it rank in the winter; and in this caſe it will be ready to feed in February or March, or to mow again in April.

If natural graſs grows among the burnet, it may be harrowed in the ſame manner as lucerne; for, having a tap-root, the harrow will not hurt it: but it muſt not be ploughed, leſt the roots ſhould be broken in the ground.

When the ſeeds of this plant are to be ſaved, it muſt neither be fed, nor mowed, in the ſpring. The ſeed will be ripe about the middle of June, when it muſt be reaped like wheat, and threſhed on a cloth. It ſhould be threſhed before it is too dry, becauſe

becauſe it is apt to ſhed, and it ſhould afterwards be dried perfectly.

Burnet does not loſe its leaves in drying; and though the hay made of it be ſticky, it will, after threſhing, be very agreeable to horſes, which are ſo fond of it, that they never waſte any. One acre will produce upwards of three loads of hay, and above forty buſhels of ſeeds. Horſes are fonder of this ſeed, than they are of oats: and Mr. Rocque is of opinion, that it is a more proper food for thoſe who do not labour hard, becauſe it is not of ſo hot a nature. Burnet bears ſeed twice a year, and will afterwards yield a good ſpring crop.

It is not only good for horſes, but alſo for all manner of cattle; even for ſwine: and Mr. Rocque has experienced another virtue in it, which is, that, being ſtung by a waſp, the leaves of this plant rubbed pretty hard upon the part ſo injured, immediately took off the inflammation.

Mr. Worlidge mentions as another excellent quality of this plant, that all good houſewives hold, as an infallible rule, that there never need be bad cheeſe or butter, but eſpecially cheeſe, where ſaxifrage grows: "from whence," adds he, "it cometh, that the Netherlands abound much in that "commodity, and only, as is ſuppoſed, through "a plenty of this herb." *Mills's Huſbandry.*

BURNING, the action of fire on ſome pabulum or fuel, whereby the minute parts of thoſe bodies are ſeparated from one another, and put into a violent motion by the action of the fire. See FIRE.

BURNING, or BRENNING, in our ancient cuſtoms, implies an infectious diſeaſe, got in the ſtews by converſing with lewd women; and ſuppoſed to be the ſame with what is now called the venereal diſeaſe.

BURNING-GLASSES, are convex or concave, commonly ſpherical, which being expoſed to the ſun, do collect all the rays falling upon them into a very ſmall ſpace, called the focus, at a certain diſtance from the glaſs in the axis thereof, where wood or any other combuſtible matter being put, will be ſet on fire. Metalline concaves, that produce this effect by reflection, are called burning-concaves.

Theſe glaſſes, by collecting the rays of the ſun into a focus, as before-mentioned, do excite a more violent heat, and burn quicker than the hotteſt wind-furnace; as appears by the melting and calcining the hardeſt metals, and by vitrifying bricks and ſtones in much leſs proportions of time than a minute: yet the rays of the moon being collected by the ſame glaſſes do not excite the leaſt ſenſible heat, nor do they ſenſibly affect the niceſt thermometer when caſt upon the ball of it, though the brightneſs of the light be very much increaſed. By meaſuring the breadth of the round image at the focus, and by comparing it with the breadth of the glaſs itſelf, it appears that ſome of theſe burning-glaſſes collect the incident rays into a ſpace about two thouſand times leſs than they poſſeſſed at their incidence. But by the preceding calculation, the light of the moon muſt be condenſed about ninety thouſand times to make it as denſe and as warm as the direct rays of the ſun. It is no wonder then that the heat of the moon's rays is not ſenſible in the focus of the glaſs, being even then forty or fifty times thinner than the direct rays of the ſun. For it is found by experiment, that the degrees of heat are proportionable to the denſities of the rays; which being compared with a ſcale of the degrees of heat and warmth of ſeveral natural bodies, determined by Sir Iſaac Newton in the Philoſophical Tranſactions, N° 270. it appears, there is a vaſt diſproportion between the degrees of light which the eye can bear and be ſenſible of, and the degrees of heat which the touch can bear and be ſenſible of.

The famous Mr. De la Hire has endeavoured to raiſe the antiquity of lenſes, or lenticular burning-glaſſes, to a very great height, imagining he has found them among the cloud of Ariſtophanes, Act. II. Sect. 1. where Strepſiades tells Socrates he had found out an excellent contrivance for paying his debts, which was to melt the bond, (which in thoſe days was written on wax) by means of a round tranſparent ſtone or glaſs; which, the ſcholiaſt ſays, they rubbed with oil, and heated it, and then they brought it to a match; and after this manner they lighted the fire. De la Hire cannot underſtand what the oil was for, unleſs it was to poliſh the glaſs; but be that as it will, he ſays the ſcholiaſt conceived it was convex; which ſhews, that in his time, though later than Ariſtophanes, they uſed ſuch glaſſes to kindle a fire.

Conſidering that catoptrics was known and cultivated by the ancients long before dioptrics, it is ſurprizing they could not account for burning by reflection from a concave metal. Euclid in his catoptrics ſays, its center is the burning point; becauſe all the rays which paſs through it are returned directly back to it. But as the ſun's diameter is ſo ſmall, theſe rays are but very few, and the conſequence would be, that a very broad ſpeculum would burn no better than a narrow one, which is contrary to experience. It is evident from this, and many other blunders in that book, that Euclid, the geometer, was not the author of it; and alſo that the ancients made very groſs experiments.

But ſince the effects of burning with ſolid ſpheres, or glaſs-bottles filled with water, was ſo well known to the ancients, how came it to paſs that they did not know their effects in magnifying objects? Had the Greek and Latin philoſophers known this augmentation of objects, would they not have mentioned it frequently, and would not ſeveral metaphors and illuſions to it have been brought into their language?

Mr. De la Hire accounts for this overſight of theirs, partly from their falſe notion about the manner of viſion, viz. by certain whimſical emanations from the eye, that went out in queſt of objects, or elſe by little repreſentations in miniature, which came from them, and ſought out for our eyes; ſo that having no ſuſpicion of pencils of rays, nor of our focus's, they could ſee no analogy between a burning-glaſs and the manner of viſion.

This indeed is a ſufficient reaſon for their not diſcovering its magnifying power by theory; but can it be ſuppoſed they never looked through thoſe ſpheres? To this our author anſwers, that the focus of a ſphere of glaſs is at the diſtance of half the radius from the neareſt ſurface; ſo that if theſe ſpheres had been ſix inches in diameter, which is the moſt they can be ſuppoſed to be, the object in view muſt have been placed at one inch and a half from the ſphere, to be ſeen diſtinctly. But it is natural, and almoſt neceſſary, that when any one had looked through theſe ſpheres, the objects in view would have been farther off, which, inſtead of appearing bigger, would only have looked confuſed. A defined or diſtinct augmentation of diſtant objects, requires either very large ſpheres, which is impracticable, or portions of large ſpheres, as is now practiſed with great ſucceſs. And beſides, they muſt have known how to have wrought and ground their glaſſes as we do; whereas, in all probability, the ancients only knew how to blow their glaſs, and make veſſels of it.

Among the ancients, the burning-mirrours of Archimedes and Proclus are accounted the moſt famous; by one of thoſe the Roman ſhips, beſieging Syracuſe, under the command of Marcellus, were burnt to aſhes; and by the other, the navy of Vitalian, beſieging Byzantium; according to Zonaras, Tretzes, Galen, &c.

Kercher, *in Arte magna Lucis & Umbræ*, ſays, that he found, by experience, the beſt burning-concaves were ſuch as did not exceed an arch of eighteen degrees in their breadth. If the ſegments of a greater ſphere and a leſſer lie each eighteen degrees in breadth, or even ſomething more or leſs, the number of degrees in both being the ſame, the effects of the greater ſegments will be the greateſt. Burning-glaſſes, that are ſegments of a greater ſphere, do burn at a greater diſtance than thoſe that are ſegments of a leſſer ſphere. Manfredus Septala, at Milan, made a parabolic ſpeculum of this kind, that would burn wood at the diſtance of ſixteen paces.

Mr. Villette, at Lyons in France, made a metalline burning-concave, of a round figure, thirty inches in diameter, and about a hundred pounds weight, the focus, or burning-point, being about three feet diſtant from the concave, and its bigneſs about half a louis d'or. This would burn or melt iron in forty ſeconds, ſilver in twenty-four, copper in forty-two; and turned quarry-ſtone into glaſs in forty-five, and mortar in fifty-three; and melted a piece of watch-ſpring in nine ſeconds.

Mr. Villette afterwards made another, of thirty-four inches in diameter, that would melt all ſorts of metals, of the thickneſs of a crown piece, in leſs than a minute; and vitrify brick in the ſame time.

In the Philoſophical Tranſactions, N° 188. we find mentioned a copper burning-concave, made at Luſace, in Germany, of near three Leipſick ells in diameter, and its focus two ells off; being ſcarce twice ſo thick as the back of a common knife, and whoſe force is incredible: for a piece of wood put into the focus, flames in a moment; a piece of lead or tin, three inches thick, will be melted quite through in three minutes time; a piece of iron or ſteel is preſently red-hot, and ſoon after hath a hole burnt through it. Copper, ſilver, &c. applied to the focus, melt; and the iron or ſteel aforeſaid melt in five minutes; ſlate in a few minutes will be turned into black glaſs; as will tiles, earthen potſherds, bones, &c.

Mr. Tſchirhauſen is ſaid to have made convex burning-glaſſes, of three or four feet in diameter, and whoſe focus is twelve feet diſtant, and of an inch and a half in diameter; and, to make this focus ſtill ſtronger, he contracts it by a ſecond lens, placed parallel to, and at a due diſtance from the firſt, and ſo makes the focus but eight lines in diameter. This glaſs vitrifies tiles, ſlates, pumice-ſtones, &c. in a moment. It melts ſulphur, pitch, and all roſins under water; any metal expoſed to it in little lumps, upon a coal, melt in a moment; and iron ſparkles as in a ſmith's forge: all metals vitrify on a piece of China-plate, if it be not ſo thin as to melt itſelf; and gold, vitrified, receives a purple colour.

Sir Iſaac Newton preſented a burning-glaſs to the Royal Society, conſiſting of ſeven concave-glaſſes, ſo placed, as that all their foci join in one phyſical point, each glaſs being about eleven inches and a half in diameter. Six of them are placed round the ſeventh, to which they are all contiguous; and they compoſe a kind of ſegment of a ſphere, whoſe ſubtenſe is about thirty-four inches and a half, and the central glaſs lies about an inch further in than the reſt; the common focus is about twenty-four inches and a half diſtant, and about half an inch in diameter. This glaſs vitrifies brick, tile, &c. in a moment, and in about half a minute melts gold. A certain artificer of Dreſden is ſaid to have made very large burning-concaves of wood, whoſe effects were little inferior to thoſe made by Tſchirhauſen. It is likewiſe ſaid, that one Newman, at Vienna, in the year 1699, made a burning-ſpeculum of ſtiff-paper, and ſtraw glued to it. And Zacharias Traberus, in Nervo, optician, ſays, that very large burning-ſpeculums may be made of thirty, forty, or more con-

cave ſpeculums, or ſquare pieces of glaſs, conveniently placed together in a large turned wooden concave or diſh; and that their effect will not be much leſs than if the ſuperficies were contiguous.

Mr. De Buffon made one in the above manner, conſiſting of 168 ſmall mirrours, or flat pieces of looking-glaſs, each ſix inches ſquare, by means of which, with the faint rays of the ſun, in the month of March, he ſet on fire boards of beech-wood at a hundred and fifty feet diſtance. Beſides, his machine has the conveniency of burning downwards, or horizontally, as one pleaſes; each ſpeculum being moveable, by the means of three ſcrews, to be ſet to a proper inclination for directing the rays to the given point: and it turns in its greater focus, or in any nearer interval, which our common burning-glaſſes cannot do, their focus's being fixed and determined. Mr. Buffon, at another time, burnt wood at the diſtance of two hundred feet; he alſo melted lead at the diſtance of above one hundred and twenty feet, and ſilver at fifty.

In order to account for the nature of burning-glaſſes, whether mirrours, or lenſes, we muſt conſider the area of their ſurfaces, and the focal diſtance; becauſe both theſe qualities enter into the expreſſion of their power of burning. The number of incident rays is as the area of the mirrour or lens, and the area of the ſmall ſpace into which the rays after reflection or refraction are concentered in the focus; being inverſely as the ſquare of the focal diſtance, it follows that the denſity of the rays, or power of burning, will be as the area of the glaſs directly, and the ſquare of the focal diſtance inverſely; and, conſequently, if *a* and *b* repreſent the areas of two propoſed burning-glaſſes, whoſe focal diſtances are *d* and *c* reſpectively, then will *p*, the power of burning in the greater, be to *q*, the power of burning in the leſſer, as *acc* to *bdd*; hence we get $pbdd = qacc$, from whence the ratio of *a* to *b*, or that of *d* to *c*, may alſo be determined. See LENS, MIRROUR, REFRACTION, &c.

BURNING *of Land*, a very great improvement in huſbandry, and is not only at this time uſed in many parts of this and other kingdoms, but it has been practiſed from the earlieſt times. Virgil very expreſsly mentions, and greatly recommends it; and all the old writers of huſbandry ſay much in its praiſe.

It does not take effect, however, in all ſorts of ground. It is not proper for rich ſoils, nor for ſtony or chalky ones; nor is it a practice often to be repeated on any land, eſpecially where the ſurface is very ſhallow; nor muſt corn be ſown too long upon the land afterwards; for burning exhauſts the good juices of the land, in ſome degree, as well as the bad ones. It is moſt profitably uſed to ſuch lands as have laid a long time uncultivated, and over-run with rank weeds, ſuch as ſour graſs, fern, heath, furze, and the like. Some lands, when corn is ſown upon them, run it up into ſtraw, and make the ears but poor and light; theſe are, beyond all others, improved by burning. The uſual methods of ploughing up for this is with a breaſt-plough, which a man puſhes before him, and cuts the turf off the ſurface, turning it over when he has cut it to about eighteen or twenty inches long. The common way is only to pare it about half an inch thick; but if it be very full of weeds, with ſtubborn roots, it is better to go deeper.

If the ſeaſon proves dry, the turf needs no more turning, but dries as it lies. If it be wet, it is neceſſary to ſet it on edge, and keep it hollow till ſuch time as the wind and air have ſufficiently dried it. It is then to be piled up in little heaps, about the quantity of two wheel-barrows full in each heap; and if there be much roots and a good head upon it, there needs no farther care but ſetting it on fire, and the whole heap will be reduced to aſhes; but if it be earthy and too dead to burn out by itſelf, there muſt be a heap of furze or heath laid under every parcel.

When the heaps are reduced to aſhes, they are left upon the place till ſome rain comes to wet them; otherwiſe, in the ſpreading, they would all blow away. When they are wetted, the farmer takes the opportunity of a calm day, and ſpreads them as equally as poſſible over the whole land, cutting away the earth a little under the heaps, to abate its over-great fertility there. After this, the land is to be ploughed but very ſhallow, and the corn is to be ſown upon it only in half the quantity that it is upon other land; and the later this is ſown the better. If it be wheat, the beſt time is the latter end of October; for if ſown ſooner, it is apt to grow too rank. The beginning of May is the proper time for cutting the turf off from theſe lands, becauſe there is then time ſufficient to get the land in order for ſowing at the proper ſeaſon. The whole charge of cutting, carrying, and burning the turf, is generally about twenty-four ſhillings an acre.

The turf is not to be burnt to white aſhes; for this waſtes a great part of its ſalt; it is only to be burnt ſo as to crumble all to pieces, and be in a condition to ſpread well upon the land; and it is better that the heaps of it ſhould burn ſlowly and gradually than furiouſly.

Some farmers ſtub up furze, heath, and the like, and, covering heaps of them with the parings of the earth, ſet fire to them; others burn the ſtubble of the corn-fields; and others the ſtalks of all ſorts of weeds, and add half a peck of unſlaked lime to every buſhel of aſhes. They cover the lime with the aſhes, and leave heaps in this manner till there comes ſome rain to ſlake the lime; and after this, they ſpread the mixture carefully over the field. There is one great advantage attending this ſort of manure, which is, that it does not breed weeds like the common way with dung, but only fill the ears

of the corn, not running them up into ſtalk; but it is proper to add ſome dung to theſe lands at the time of ploughing them up for a ſecond or third crop of corn. *Mortimer's Huſbandry.*

BURNING, in enamel painting. See ENAMEL *Painting.*

BURNISHER, a round poliſhed piece of ſteel, ſerving to ſmooth and give a luſtre to metals.

Of theſe there are different figures, ſtraight, crooked, &c. Half burniſhers are uſed to ſolder ſilver, as well as to give a luſtre. See the article SOLDERING.

BURNISHING, the art of ſmoothing or poliſhing a metalline body, by a briſk rubbing of it with a burniſher.

BURR, the round knob of a horn next a deer's head.

BURSA-PASTORIS, ſhepherd-pouch, in botany, a plant which grows wild in many parts of England: it hath a white, ſtraight, fibrous, ſlender root, with a ſtalk which riſes about a foot high; the lower-leaves are jagged like dandelion; but thoſe which grow on the ſtalks are leſs broad, with even edges, and terminate in a point: the flowers are placed in rows on the top of the branches, and are ſmall and cruciform; they conſiſt of four roundiſh petals, with ſix ſmall ſtamina, two of which are ſhorter than the others; the fruit is in the ſhape of a heart or purſe, and is divided into two cells, containing two or three ſeeds in each. This plant is ſaid to be a vulnerary aſtringent, cooling herb, and is given in hæmorrhages and fluxes: the country people, with good ſucceſs, apply it to cuts and freſh wounds; and it is reported to cure quartan and tertian agues, if made into a cataplaſm, and applied to the wriſts juſt before the coming on of the fit. This plant is claſſed by Linnæus with the thlaſpi. See the article THLASPI.

BURSERA, in botany, a genus of hexandrious plants; the flower conſiſts of three plane ovated ſharp-pointed petals, with ſix upright awl-ſhaped filaments, topped with oblong antheræ; the germen is egg-ſhaped, and turns to a capſule of the ſame form, which contains a ſingle baccated compreſſed ſeed.

BURTON, a ſort of ſmall taicle made by two blocks or pullies till the rope becomes three or four-fold, and acquires an additional power in proportion.

It is uſed to draw tight the top-maſt ſhrouds; and may be otherwiſe employed to move, or draw along, any weighty body on the deck, or in the hold; as, anchors, bales of goods, &c.

BUSH, in botany, a term uſed for divers ſorts of low growing ſhrubs; thus we ſay a goſeberry-buſh, a currant-buſh, a furze-buſh, &c. it is alſo uſed when there is an aſſemblage of branches growing interwoven, or mixed together.

BUSHEL, a meaſure of capacity for dry things; as, grain, fruits, dry pulſe, &c. containing four pecks, or eight gallons, or one-eighth of a quarter.

A buſhel, by 12 Henry VII. c. 5. is to contain eight gallons of wheat; the gallon eight pounds of troy-weight; the ounce twenty ſterlings, and the ſterling thirty-two grains, or corns of wheat growing in the midſt of the ear. See the articles MEASURE and WEIGHT.

At Paris, the buſhel is divided into two half buſhels; the half buſhel into two quarts; the quart into two half quarts; the half quart into two litrons; and the litron into two half litrons.

BUSKIN, a kind of ſhoe, ſomewhat in manner of a boot, and adapted to either foot, and worn by either ſex.

This part of dreſs, covering both the foot and mid-leg, was tied underneath the knee; it was very rich and fine, and principally uſed on the ſtage by actors in tragedy. It was of a quadrangular form, and the ſole was ſo thick, as that by means thereof, men of the ordinary ſtature might be raiſed to the pitch and elevation of the heroes they perſonated. The colour was generally purple on the ſtage; and was diſtinguiſhed from the ſock, worn in comedy, that being only a low common ſhoe. The buſkin ſeems to have been worn, not only by actors, but by girls, to raiſe their height; travellers and hunters alſo made uſe of it, to defend themſelves from the mire.

In claſſic authors, we frequently find the buſkin uſed to ſignify tragedy itſelf, in regard it was a mark of tragedy on the ſtage.

It is alſo uſed to imply a lofty ſtrain, or high ſtyle.

BUSS, in maritime affairs, a ſmall ſea-veſſel, uſed by us and the Dutch in the herring-fiſhery, commonly from forty-eight to ſixty tons burden, and ſometimes more: a buſs has two ſmall ſheds or cabins, one at the prow, and the other at the ſtern; that at the prow ſerves for a kitchen.

BUST, or BUSTO, in ſculpture, &c. a term uſed for the figure or portrait of a perſon in relievo, ſhewing only the head, ſhoulders, and ſtomach, the arms being lopped off: it is uſually placed on a pedeſtal, or conſole.

BUSTARD, in ornithology, the Engliſh name of a genus of birds, called by authors otis. See OTIS.

BUSTUARII, in Roman antiquity, gladiators who fought about the buſtom, or funeral pile of a deceaſed perſon of diſtinction, in the ceremony of his obſequies.

BUTCHER-BIRD, in ornithology, the Engliſh name of the lanius. See LANIUS.

BUTCHER'S-BROOM, *Ruſcus*, in botany. See the article RUSCUS.

BUTLER, *Buticularius*, the name anciently given to an officer in the court of France, being the

the ſame as the grand echanſon, or great cup-bearer of the preſent times.

BUTLER, in the common acceptation of the word, is an officer in the houſes of princes and great men, whoſe principal buſineſs is to look after the wine, plate, &c.

BUTMENTS, in architecture, thoſe ſupporters or props on or againſt which the feet of arches reſt. See BRIDGE.

BUTMENT is alſo the term given to little places taken out of the yard or ground-plot of a houſe, for a buttery, ſcullery, &c.

BUTOMUS, in botany, an aquatic plant which grows common in ſtanding-waters in ſeveral parts of England; the flower of which conſiſts of ſix roundiſh concave petals, alternately exterior, ſmaller, and more acute; with nine ſubulated filaments, topped with double lamellated antheræ: the fruit conſiſts of ſix oblong-pointed erect capſules of one valve, containing ſeveral oblong cylindric ſeeds, obtuſe at both ends. It is ſaid to be of an aperient and deobſtruent quality.

BUTT, in naval architecture, the end of any plank in a ſhip's ſide which unites with the end of another: when a plank is looſened at the end by the ſhip's weakneſs or labouring, ſhe is ſaid to have ſtarted, or ſprung a butt.

BUTTER, a fat unctuous ſubſtance, prepared or ſeparated from milk by churning it. For the manner of making butter, ſee the article DAIRY.

The word is formed from the Greek, βυτυρον, which is compounded of βες, a cow, and τυρος, cheeſe.

BUTTER, among chemiſts, a name given to ſeveral preparations, on account of their conſiſtence reſembling that of butter; as, butter of antimony, of arſenic, of wax, of lead, of tin, &c.

BUTTER-BUMP, in zoology, a bird of the heron kind, more uſually called bittern. See the article BITTERN.

BUTTER-BUR, in botany. See the article PETASITES.

BUTTERFLY, the Engliſh name of a numerous genus of inſects, called by zoologiſts papillio. See PAPILLIO.

BUTTERFLY-FISH, a ſpecies of the blennius of ichthyologiſts, with a furrow between the eyes. It is common in the American ſeas.

BUTTERFLY-FLOWERS, in botany, the ſame as papilionaceous-flowers; they compoſe the ſeventeenth claſs in the Linnean ſyſtem of botany; ſuch are the bloſſoms of the pea, bean, broom, lupine, and various others.

BUTTERIS, in the manege, an inſtrument of ſteel, fitted to a wooden handle, wherewith they pare the foot, or cut the hoof of a horſe.

BUTTER-MILK, a kind of ſerum that remains behind, after the butter is made. Of this curds may be made, which are good when eat either with cream, wine, ale, or beer. And the whey, kept in a clean ſtrong veſſel, is an excellent cooling, wholeſome drink, to be uſed in the ſummer inſtead of other drink, and will quench the thirſt better than beer.

Butter-milk is eſteemed an excellent food, in the ſpring eſpecially, and is particularly recommended in hectic fevers.

BUTTER-WORT, in botany. See the article PINGUICULA.

BUTTERY, a room in the houſes of noblemen and gentlemen, belonging to the butler, where he depoſites the utenſils belonging to his office, as table-linen, napkins, pots, tankards, glaſſes, cruets, ſalvers, ſpoons, knives, forks, pepper, muſtard, &c.

BUTTOCK, in naval architecture, the round parts of a ſhip behind, under the ſtern, terminated by the counter above, and the after-part of the bilge below.

BUTTON, an article in dreſs, whoſe form and uſe are too well known to need deſcription.

Buttons are made of various materials, as mohair, ſilk, horſe-hair, metal, &c.

Method of making common BUTTONS. Common buttons are generally made of mohair; ſome indeed are made of ſilk, and others of thread; but the latter are a very inferior ſort. In order to make a button, the mohair muſt be previouſly wound on a bobbin; and the mould fixed to a board by means of a bodkin thruſt through the hole in the middle of it. This being done, the workman wraps the mohair round the mould in three, four, or ſix columns, according to the button.

Horſe-Hair BUTTONS. The moulds of theſe buttons are covered with a kind of ſtuff compoſed of ſilk and hair; the warp being belladine ſilk, and the ſhoot horſe-hair. This ſtuff is wove with two ſelvedges in the ſame manner, and in the ſame loom as ribbands. This ſtuff is cut into ſquare pieces proportioned to the ſize of the button, wrapped round the moulds, and their ſelvedges ſtitched together, which form the under part of the button.

Cleanſing of BUTTONS. A button is not finiſhed when it comes from the maker's hands; the ſuperfluous hairs and hubs of ſilk muſt be taken off, and the button rendered gloſſy and beautiful, before it can be ſold. This operation is performed in the following manner:

A quantity of buttons are put into a kind of iron ſieve, called by workmen a ſinging-box. Then a little ſpirit of wine being poured into a ſhallow iron-diſh, and ſet on fire, the workman moves and ſhakes the ſinging-box, containing the buttons, briſkly over the flame of the ſpirit, by which means the ſuperfluous hairs, hubs of ſilk, &c. are burnt off, without damaging the buttons. Great care however muſt be taken that the buttons in the ſinging-box

box be kept continually in motion; for if they are suffered to rest over the flame, they will immediately burn.

When all the loose hairs, &c. are burnt off by the flame of the spirit, the buttons are taken out of the singing-box, and put, with a proper quantity of the crumbs of bread, into a leather-bag, about three feet long, and of a conical shape; the mouth or smaller end of which being tied up, the workman takes one of the ends in one hand, and the other in the other, and shakes the bag briskly, with a particular jerk. This operation cleanses the buttons, renders them very glossy, and fit for sale.

Gold-Twist BUTTONS. The mould of these buttons is first covered with the silk in the same manner as that of common buttons. This being done, the whole is covered with a thin plate of gold or silver, and then wrought over in different forms with purple and gimp. The former is a kind of thread composed of silk and gold-wire twisted together; and the latter, capillary tubes of gold or silver, about the tenth of an inch in length. These are joined together by means of a fine needle filled with silk, thrust through their apertures, in the same manner as beads or bugles.

The manner of making Metal BUTTONS. The metal with which the moulds are intended to be covered is first cast into small ingots, and then flatted into thin plates or leaves, of the thickness intended, at the flatting-mills; after which it is cut into small round pieces proportionable to the size of the mould they are intended to cover, by means of proper punches on a block of wood covered with a thick plate of lead. Each piece of metal thus cut out of the plate is reduced into the form of a button, by beating it successively in several cavities, or concave moulds, of a spherical form, with a convex puncheon of iron; always beginning with the shalloweſt cavity or mould, and proceeding to the deeper, till the plate has acquired the intended form: and the better to manage so thin a plate, they form ten, twelve, and sometimes even twenty-four to the cavities, or concave moulds, at once; often nealing the metal during the operation, to make it more ductile. This plate is generally called by workmen the cap of the button.

The form being thus given to the plates, or caps, they strike the intended impression on the convex side by means of a similar iron puncheon in a kind of mould engraven en creux, either by the hammer, or the press used in coining. The cavity of mould, wherein the impression is to be made, is of a diameter and depth suitable to the sort of button intended to be struck in it; each kind requiring a particular mould. Between the puncheon and the plate is placed a thin piece of lead, called by the workmen a hob, which greatly contributes to the taking off all the strokes of the engraving; the lead, by reason of its softness, easily giving way to the parts that have relievo; and as easily insinuating itself into the traces or indentures.

The plate thus prepared makes the cap or shell of the button. The lower part is formed of another plate, in the same manner, but much flatter, and without any impression. To the last or under plate is soldered a small eye made of wire, by which the button is to be fastened.

The two plates being thus finished, they are soldered together with soft solder, and then turned in a lathe. Generally indeed they use a wooden mould instead of the under plate; and in order to fasten it, they pass a thread or gut across, through the middle of the mould, and fill the cavity between the mould and the cap with cement, in order to render the button firm and solid; for the cement entering all the cavities formed by the relievo of the other side sustains it, prevents its flattening, and preserves its bosse or design.

BUTTON-MOULD, the piece of wood, &c. covered with mohair, silk, metal, &c.

Manner of making BUTTON-MOULDS. The wood is first sawn into pieces of a proper thickness; and then the moulds turned out of these pieces by means of tools called piercers, of various forms and dimensions, according to the nature and size of the moulds intended to be made. If the moulds are very small, they are turned in a small lathe, by means of a bow; but if large, in a lathe turned by a wheel, as one man cannot turn the lathe with his foot, and manage the block of wood at the same time; at least not with that facility or dispatch as in the other manner.

BUTTON-TREE, in botany. See the article CONOCARPUS.

BUTTON-WEED. See SPERMACOCE.

BUTTON-WOOD. See CEPHALANTHUS.

BUTTON, in fencing, signifies the end or tip of a foil, being made roundish, and usually covered with leather, to prevent making contusions in the body.

BUTTON, in building, denotes a slight fastening for a door or window, made to turn on a tail.

BUTTON *of the Reins of a Bridle*, is a ring of leather, with the reins put through it, running all along the length of the reins.

BUTTON, *Antennæ*, a name given by naturalists to those antennæ, or horns, as they are called, of butterflies, which are slender, and terminated at the top by a sort of button, in form of an olive, or part of one.

BUTTRESS, a kind of butment built archwise, or a mass of stone or brick, serving to prop or support the sides of a building, wall, &c. on the outside, where it is either very high, or has any considerable load to sustain on the other side, as a bank of earth, &c.

Buttresses are used against the angles of steeples and other buildings of stone, &c. on the outside,

and along the walls of ſuch buildings as have great and heavy roofs, which would be ſubject to thruſt the walls out, unleſs very thick, if no buttreſſes were placed againſt them: they are alſo placed for a ſupport and butment againſt the feet of ſome arches that are turned acroſs great halls, in old palaces, abbeys, &c.

The theory and rules of buttreſſes are one of the deſiderata in architecture; but the ſize and weight of them ought to be in proportion to the dimenſions and form of the arch, and the weight which is ſuperincumbent on it.

As to the weight of the materials, both on the arch and in the buttreſs, it is not difficult to calculate: but it may be objected, that there may be a ſenſible difference as to the ſtrength and goodneſs of the mortar, which may, in ſome meaſure, compenſate for the weight of the buttreſs. See BRIDGE.

BUXUS, the box-tree, in botany, a genus of ever-green ſhrubs; the branches are numerous and furniſhed with oblong, ſmall, hard, thick, ſhining leaves, of a diſagreeable bitteriſh ſmell and taſte; the flowers are male and female, produced on the ſame plant; the male flowers have a three-leaved concave empalement, with two roundiſh petals, in which are inſerted four awl-ſhaped filaments, topped with double erect antheræ. The female flower hath a tetraphyllous calyx, with three concave roundiſh petals, in which is placed a three-cornered, obtuſe, roundiſh germen, ſupporting three very ſhort ſtyles, crowned with obtuſe prickly ſtigma. The fruit is ſhaped like a pottage-pot inverted; of a green colour, divided into three cells, containing each two oblong ſeeds, which, when ripe, are thrown out by the elaſticity of the veſſels; theſe are brown, long, and of a ſhining colour. There are three ſpecies of box noticed by botaniſts; one of which, called the dwarf, or Dutch box, is much uſed for edging of flower-beds, or borders, for which purpoſe it exceeds all other plants, as it will bear the extremes of heat and cold, is more laſting, and will grow in almoſt any ſoil. This is eaſily increaſed, by parting the roots: the ſeaſon for planting in dry lands is in September, and in moiſt ſoils in March. The other ſpecies grow in divers parts of England, particularly on Box-hill in Surrey, and are of a conſiderable ſize. The wood of theſe trees is of a yellow colour, and more compact and ponderous than any of the other European woods, and is therefore of conſiderable uſe to turners, engravers, and mathematical inſtrument-makers, it being ſo hard and cloſe as to ſink in water, which renders it very valuable for divers utenſils. Box is ſeldom uſed in medicine, though ſome pretend it has the ſame virtues as guaiacum. The oil diſtilled from the wood is a great narcotic, and is ſometimes uſed for the tooth-ach, by putting a drop into a hollow rotten tooth.

BUZZARD, *Buteo*, in ornithology, the Engliſh name of ſeveral ſpecies of the hawk-kind, diſtinguiſhed from each other by particular epithets; as, 1. The bald buzzard, with blue legs. 2. The common buzzard. 3. The honey buzzard. 4. The ſubbuteo, or the hen-harrier, and the ring-tail. 5. The moor-buzzard, &c.

BY-LAWS, or BYE-LAWS, private and peculiar laws for the good government of a city, court, or other community, made by the general conſent of the members.

BYRLAW, or BURLAW-LAWS, in Scotland, are made and determined by neighbours elected by common conſent in byrlaw-courts. The men, choſen as judges, are called byrlaw, or burlawmen, and take cognizance of complaints between neighbour and neighbour.

BYSSUS, in botany, a genus of moſſes, conſiſting of plain, ſimple, capillary filaments.

The byſſus is the moſt imperfect of all vegetables, no part of its fructification having been hitherto diſcovered: its filaments are uniform, and often ſo fine as to be ſcarce diſcernible ſingly; tho', in a cluſter, they make a kind of fine down. Botaniſts are not agreed whether the byſſus be properly a moſs or fungus. Linnæus is of the latter opinion, and the generality of botaniſts of the former. Dillenius thinks it is of a middle nature, between both.

This difference of opinion probably aroſe from hence, that authors have confounded two very diſtinct vegetables under the name byſſus; the one, the filamentoſe bodies, deſcribed above, which are the only true byſſi; and the other, the duſty matter found on rotten vegetables, conſiſting of ſmall globules. The byſſi are nearly allied to the confervæ; from which however they differ, as conſiſting of finer, ſhorter, and more tender filaments, and not growing in water as the confervæ do.

BYSSUS, in antiquity, that fine Egyptian linen whereof the tunics of the Jewiſh prieſts were made.

Philo ſays, that the byſſus is the cleareſt and moſt beautiful, the whiteſt, ſtrongeſt, and moſt gloſſy ſort of linen; that it is not made of any thing mortal, that is to ſay, of wool, or the ſkin of any animal, but that it comes out of the earth, and becomes ſtill whiter, and more ſhining, every time it is waſhed as it ſhould be.

BYTTNERIA, in botany, a genus of pentandrious plants, whoſe flower conſiſts of a monophyllous cup, divided into five parts, with five ſhort oblong petals; the fruit is a depreſſed roundiſh capſule, containing an ovated compreſſed ſeed.

BYZANT, or BEZANT. See BEZANT.

C.

C, The third letter and second conſonant of the alphabet, is pronounced like *k*, before the vowels *a*, *o*, and *u*; but like *s*, before *e* and *i*.

As an abbreviature, C ſtands for Caius, Carolus, Cæſar, *condemno*, &c. and C C for *conſulibus*.

As a numeral, C ſignifies 100, C C 200, &c.

C, in muſic, placed after the cliff, intimates, that the muſic is in common time, which is either quick or ſlow, as it is joined with alegro or adagio: if alone, it is uſually adagio.

If the C be croſſed or turned, the firſt requires the air to be played quick, and the laſt very quick.

CAABA, a ſquare ſtone edifice in the temple of Mecca, ſuppoſed to have been built by Abraham and his ſon and Iſhmael; being the part principally reverenced by the Mahometans, and to which they always direct themſelves in prayer.

The word is Arabic, caaba, and caabah, a denomination which ſome will have given to this building, on account of its height, which ſurpaſſes that of the other buildings in Mecca; but others, with more probability, derive the name from the quadrangular form of the ſtructure itſelf.

CAAMINI, in botany, the name by which the Spaniards call the finer kind of Paraguay-tea. See the article PARAGUAY.

CAAPEBA, in botany. See the article CISSAMPELUS.

CAB, or KAB, a Hebrew meaſure of capacity, equal to the ſixth part of the ſeah, or an eighteenth of the ephah.

The cab of wine contained two Engliſh pints; the cab of corn 2⅔ pints, corn meaſure.

CABALA *Vein*, in natural hiſtory, a name given by our Suſſex miners to one kind of the iron ore commonly wrought in that country. It is a ſtony ore, of a browniſh colour, with a bluſh of red, which is more or leſs conſpicuous in different parts of the ſame maſſes.

CABALLINE denotes ſomething belonging to horſes: thus caballine aloes is ſo called from its being chiefly uſed for purging horſes; and common brimſtone is called ſulphur caballinum for a like reaſon.

CABBAGE, *Braſſica*, in botany, a genus of tetradynamious plants, the flowers of which are tetrapetulous and cruciform: the piſtil which ariſes from the cup becomes afterward a long taper pod depreſſed on each ſide, and is terminated by the apex of the intermediate partition, which divides it into two cells filled with a number of round ſeeds. There are divers ſpecies belonging to this family of plants; as alſo ſeveral varieties belonging to ſome of the ſpecies, occaſioned by different ſoils and culture; ſuch as the Savoy cabbage, the red cabbage, the early cabbage, the ſugar-loaf cabbage, the muſk cabbage, the Ruſſian cabbage, beſides the cauliflower, brocoli, borecole, colewort, and Scotch kale; but thoſe which turns in and hardens firm, is (according to the common acceptation of the word) called cabbage. This plant being a principal vegetable for our common food, it may not be amiſs to mention their culture, and firſt of the ſavoy; this ſort (as likewiſe the others) is propagated by ſowing the ſeeds; the ſeaſon for ſavoys is to ſow in the month of April, and ſome in May; and when the young plants have about ſix or eight leaves, they ſhould be planted into beds about four inches aſunder; (though this practice is omitted by the kitchen-gardeners, who raiſe great quantities for ſale, they planting them immediately from the ſeed-bed into the places they are to perfect themſelves) theſe plants by the time beans, &c. are grown to their ſize, are planted between the rows, which affords them a good ſhade, until they are well rooted, at which time the former crop is cleared away; theſe ſhould be planted at two feet and a half aſunder. The red cabbage is ſo hardy, that it will reſiſt the ſevereſt froſts: though it is not much uſed in the manner the others are, yet is the moſt proper of any for pickling, and may be ſown in the ſpring, and managed as the former.

The early or Batterſea cabbage (as it is called) is ſown for ſummer uſe, the ſeaſon for doing which is the beginning of July, and afterwards planted in beds, where they may remain till October, and then taken up and planted for good, at the diſtance of three feet row from row, and two feet and a half aſunder in the rows. In May and June this ſort begins to turn in their leaves for cabbaging, and in order to obtain them a little ſooner, the gardeners tie in their leaves cloſe with a ſlender twig to blanch their middle, by which means they have them a fortnight earlier than thoſe which turn in naturally. The ſugar-loaf cabbage requires the

ſame

ſame management and ſeaſon as the early ſort, and comes into uſe when thoſe are either cut or become ſo hard as not to be fit for the table. The muſk cabbage is much tenderer than the other ſorts, and is therefore but little cultivated. The Ruſſian cabbage is but little noticed at preſent; this ſort is ſmall and hard, and may be ſown in the ſpring, and fit for uſe in July and Auguſt. The borecole may be treated in the ſame manner as the ſavoy, but need not be planted above a foot aſunder in the rows, and the rows two feet diſtance. Theſe are never eaten till the froſt hath rendered them tender, for otherwiſe they are tough and bitter. The colewort has of later years been very little propagated, the common cabbage plants being ſubſtituted in their ſtead; thoſe are tied up in bunches, and ſold in the London Markets, and are all called coleworts, let them be of what ſort they will. The Scotch kale, or Siberian borecole, is extremely hardy, and is always ſweeter in the ſevere winters than in milder ſeaſons; this is propagated by ſowing the ſeeds in July, and afterwards tranſplanted at about a foot and a half aſunder. Theſe are fit for uſe from Chriſtmas till April; a variety of this ſort is finely coloured, and is very ornamental in ſhrubberies during the winter. To this genus Linnæus has added the turnip, navew, and rocket; which ſee explained under their reſpective articles; alſo the CAULIFLOWER and BROCOLI.

CABBAGE-TREE, *palma maxima*, or *palmeto royal*, a very beautiful tree, common in ſeveral parts of America.

It has acquired the name of royal from its remarkable height, majeſtic appearance, and elegance of its waving foliage: neither the tall cedars of Lebanon, nor any of the trees of the foreſt, are equal to it in height, beauty, or proportion.

Its roots are innumerable, reſembling ſo many round thongs, of a regular determinative bigneſs, ſeldom exceeding the ſize of the little finger, but of a great length, penetrating ſome yards into the earth, eſpecially where the ſoil is ſandy, or otherwiſe porous: theſe roots are of a dark-brown colour.

The trunk jets, or bulges out a little near the ground, by which means it hath the becoming appearance of a ſubſtantial baſis to ſupport its towering height. It is generally as ſtraight as an arrow; and ſcarce can a pillar of the niceſt order in architecture be more regular, eſpecially when it is of about thirty years growth: and as there is a natural involuntary pleaſure ariſing from the harmony of juſt geometrical proportions, ſtriking the eye of the moſt unſkilful and ignorant beholder, it is not ſtrange that theſe trees are univerſally admired.

Writers of wonders repreſent ſome of them to be three hundred feet in height: however, Mr. Hughes informs us, that in Barbadoes, where they are more numerous than in the other iſlands, that they do not exceed one hundred and thirty-four feet.

The trunk of this tree, near the earth, is about ſeven feet in circumference, the whole body growing tapering to the top.

The ſubſtance of the tree, for about two or three inches of the outſide, but within the bark, is of a blackiſh colour, and extremely hard and ſolid: this ſurrounds the inner ſubſtance, which is a whitiſh pith, intermixed with ſome ſmall veins of a more ligneous texture.

The colour of the bark much reſembles that of an aſh tree, and is very faintly clouded, at about the diſtance of every four or five inches, with the veſtigia of the fallen-off branches: this colour of the bark continues till within about twenty-five or thirty feet of the extremity of the tree: there it alters at once from an aſh-colour to a beautiful deep ſea-green, and continues to be of that colour to the top.

About five feet from the beginning of the green part upwards, the trunk is ſurrounded with its numerous branches in a circular manner; all the lowermoſt ſpreading horizontally with great regularity; and the extremities of many of the higher branches bend wavingly downwards, like ſo many plumes of feathers. Theſe branches, when full-grown, are twenty feet long, more or leſs; and are thickly ſet on the trunk alternately, riſing gradually ſuperior one to another: their broad curved ſockets ſo ſurround the trunk, that the ſight of it, whilſt among theſe, is loſt, which again appears among the very uppermoſt branches, and is there inveloped in an upright green conic ſpire, which beautifully terminates its greateſt height.

The above-mentioned branches are ſomewhat round underneath, and ſlightly grooved on the upper ſide: they are likewiſe decorated with a very great number of green pennated leaves; ſome of theſe are near three feet long, and an inch and a half broad, growing narrower towards their points, as well as gradually decreaſing in length towards the extremities of the branches.

As there are many thouſand leaves upon one tree, every branch bearing many ſcores upon it, and every leaf being ſet at a ſmall and equal diſtance from one another, the beauty of ſuch a regular lofty group of waving foliage, ſuſceptible of motion by the moſt gentle gale of wind, is not to be deſcribed.

The middle rib, in each leaf, is ſtrong and prominent, ſupporting it on the under ſide, the upper appearing ſmooth and ſhining. The pithy part of the leaf being ſcraped off, the inſide texture appears to be ſo many longitudinal thread-like filaments.

Theſe being ſpun in the ſame manner as they do hemp, or flax, are uſed in making cordage of every kind, as well as fiſhing-nets, which are eſteemed ſtronger than thoſe uſually made from any other material of the like nature.

It is obſerved, that the lowermoſt branch, for the time being, drops monthly from the tree, carrying with it an exfoliated circular lamen of the green part of the tree, from the ſetting on of the branches, to the aſh-colour part, which is about five feet in length, and in breadth the circumference of the tree at that part. This, and the branch to which it is always fixed, fall together.

When the loſs of this lower branch happens, then the green conic ſpire, which iſſues from among the center of the uppermoſt branches, and riſes ſuperior to all, partially burſts, and thruſts from its ſide a young branch, which continues the uppermoſt, till another of the lowermoſt branches drop off: then the ſpire, the common parent of all the branches, ſends forth again another branch, ſuperior in ſituation to the laſt; ſo that the annual loſs of the branches below is providentially ſupplied in this manner by thoſe above.

The green-coloured part of the tree, already mentioned, differs from the aſh-coloured part no leſs in ſubſtance than colour; the former, inſtead of being extremely hard on the outſide, and pithy within, is compoſed of ſo many coats, or ſeparate laminæ, of a tough bark-like ſubſtance, of near a quarter of an inch thick, and ſo very cloſely wrapped together, that they jointly compoſe and conſtitute that green part of the tree.

As the lowermoſt, as well as each other higher branch, when they ſucceſſively grow to be old, is joined by the broad ſocket of its foot-ſtalk to this outward coat, lamen, or folding, it is obſervable, that ſome time before the lowermoſt branch is entirely withered, this green circular coat, which to the eye appeared ſome days before to be a ſolid part of the tree, ſlits open lengthwiſe, from the ſetting on of the branches to the aſh-coloured part beneath, being about five feet in length, and the circumference of the tree in the breadth; and, peeling off, it falls with the falling branch to which it is joined by many ſtrong cartilages, leaving the next ſucceeding coat to appear for a time as a conſtituent part of the tree, till a ſucceeding withered branch carries this off likewiſe.

Mr. Hughes farther informs us, that having felled one of theſe ſtately trees, to examine its make, texture, &c. he obſerved, that the ſeveral exfoliations of its green part were equal in number to the branches.

The firſt, ſecond, third, and ſometimes the fourth of theſe laminæ are green on the outſide, and perfectly white within: all the remaining inner coats, or foldings, are of a bright lemon-colour without, and white within.

When theſe very tough huſky exfoliations are taken off, what is called the cabbage, lies in many thin, ſnow-white, brittle flakes; in taſte ſomething like the kernel of an almond, but ſweeter: it is ſo full of oil, that a curious obſerver may ſee ſeveral very ſmall cells abounding with it. Theſe flakes are called, from ſome reſemblance, when boiled, the cabbage, which then eats ſomewhat ſweet and agreeable.

What is called the cabbage-flower grows from that part of the tree where the aſh-coloured trunk joins the green part already deſcribed. Its firſt appearance is a green huſky ſpatha, growing to above twenty inches long, and about four broad; the inſide being full of ſmall white ſtringy filaments, full of alternate protuberant knobs, the ſmalleſt of theſe reſembling a fringe of coarſe white thread knotted: theſe are very numerous, and take their riſe from larger footſtalks; and theſe footſtalks likewiſe are all united to different parts of the large parent ſtalk of all.

As this huſky ſpatha is opened, while thus young, the farinaceous yellow ſeed, in embryo, reſembling fine ſaw-duſt, is very plentifully diſperſed among theſe ſtringy filaments, which anſwer the uſe of apices in other more regular flowers: theſe filaments, being cleared of this duſt, are pickled, and eſteemed among the beſt pickles in Europe.

But if this ſpatha is not cut down and opened, whilſt thus young, if it be ſuffered to continue on the tree till it grows wild and burſts; then the incloſed part, which, whilſt young and tender, is fit for pickling, will by that time have acquired an additional hardneſs, become ſoon after ligneous, grow buſhy, conſiſting of very ſmall leaves, and in time produce a great number of ſmall oval thin-ſhelled nuts, about the bigneſs of unhuſked coffee-berries: theſe, being planted, produce young cabbage-trees.

CABBAGING, among gardeners, a term uſed for ſeveral plants, whoſe leaves turn in, and become hard like a cabbage.

CABBALA, among the Jews, is properly the myſtical-interpretations of their ſcriptures, handed down by tradition.

The word is Hebrew, and literally ſignifies traditions.

CABBALISTS, thoſe Jewiſh doctors who profeſs the ſtudy of the cabbala. In the opinion of theſe men, there is not a word, letter, or accent, in the law, without ſome myſtery in it. The firſt cabbaliſtical author that we know of, is Simon, the ſon of Joachai, who is ſaid to have lived a little before the deſtruction of Jeruſalem by Titus. His book, entitled Zohar, is extant; but it is agreed that many additions have been made to it. The firſt part of this work is entitled Zenintha, or Myſtery; the ſecond Idra Rabba, or the Great Synod; the third Idra Lata, or the Little Synod, which is the author's laſt adieu to his diſciples. See RABBINS.

CABECA, or CABESSE, a name given to the fineſt ſilks in the Eaſt-Indies, as thoſe from 15 to 20 per cent. inferior to them are called barina. The Indian workmen endeavour to paſs them off one

with the other; for which reaſon the more experienced European merchants take care to open the bales, and to examine all the ſkains one after another.

CABIN, in naval architecture, a room or apartment for any of the officers of a ſhip to ſleep and dreſs in, &c.

There are many of theſe in large ſhips, the principal of which is deſigned for the captain or commander; and this in ſhips of the line is furniſhed with an elegant gallery in the ſtern. See the article GALLERY.

When any bed-places are built up at the ſides of a ſhip, which is frequently the caſe in merchantmen, they are alſo called cabins.

CABINET, a piece of joiners workmanſhip. It is a kind of preſs or cheſt, with ſeveral doors and drawers, to lock up the moſt precious things, or only to ſerve as an ornament in chambers, galleries, or other apartments.

CABINET, in a garden, is a conveniency which differs from an arbour in this; that an arbour or ſummer-houſe is of a great length, and arched over head, in the form of a gallery; but a cabinet is either ſquare, circular, or in cants, making a kind of ſaloon to be ſet at the ends, or in the middle of a long arbour.

CABINET *of Natural Hiſtory*, a building containing all the curioſities of nature, digeſted in a proper manner.

Such a building might indeed be called, with more propriety, a muſæum or repoſitory; cabinet here, therefore, muſt be underſtood in a larger ſenſe than the common acceptation of the word, as herein are exhibited to our view the animal, vegetable, and mineral kingdoms at once: in ſhort, an epitome of nature.

It is not certain whether the ancients ever formed any collections of this kind, or erected any ſtructures for the reception and diſpoſition of them. But it is not improbable, that Ariſtotle, ſupported by the generoſity and magnificence of Alexander the Great, built ſomething of this kind, at leaſt with regard to animals; becauſe the obſervations he has left us, are undoubtedly the reſult of anatomical obſervations; and the remarks he has made on the various ſpecies of animals, ſhew our knowledge, even ſince the revival of letters, to be vaſtly inferior to his in this reſpect.

The knowledge of natural hiſtory improves, as collections of this kind are made more perfect; and our own age has firſt ſet on foot eſtabliſhments that deſerve the name of cabinets of natural hiſtory.

CABIRI, a term in the theology of the ancient pagans, ſignifying great and powerful gods, being a name given to the gods of Samothracia. They were alſo worſhipped in other parts of Greece, as Lemnos and Thebes, where the cabiria were celebrated in honour of them: theſe gods are ſaid to be, in number, four, viz. Axieros, Axiocerſa, Axiocerſus, and Caſmilus.

CABIRIA, feſtivals in honour of the cabiri, celebrated in Thebes and Lemnos, but eſpecially in Samothracia, an iſland conſecrated to the cabiri. All who were initiated into the myſteries of theſe gods were thought to be ſecured thereby from ſtorms at ſea, and all other dangers. The ceremony of initiating was performed, by placing the candidate, crowned with olive branches, and girded about the loins with a purple ribbon, on a kind of throne, about which the prieſts and perſons before initiated, danced.

CABLE, in the marine, a large ſtrong rope, uſed to retain a ſhip at anchor. See the article ANCHOR.

Cables are of various kinds and ſizes; they are moſt frequently formed of hemp; ſome, however, are made of baſs, and thoſe are generally the manufacture of Barbary; others are compoſed of a ſort of Indian-graſs; and are the product of different parts of Aſia.

Every cable, of whatever thickneſs, is formed of three ſtrands or twiſts, and each of theſe made up of three ſmaller ſtrands; and thoſe laſt are compoſed of a certain number of rope-yarns, which number is greater or leſs, in proportion to the ſize of the cable required.

All ſhips have, or ought to have, at leaſt three good cables; the ſheet-cable, and the two bowers, beſt and ſmall.

All cables are, or ought to be, one hundred and twenty fathoms; for which purpoſe, the threads, or yarns, muſt be one hundred and eighty fathoms, ſince they are diminiſhed one-third in length by twiſting; but it is often neceſſary, notwithſtanding this length, to ſplice two cables, at leaſt, together, in order to double the length, when there is a neceſſity to let go the anchor into deep water; for although a ſhip ſeldom anchors in above forty fathoms depth, if there is but one cable, the lower part of it will ſcarce bear on the ground, and the anchor will be obliged to ſuſtain all the ſhocks and jerks of the ſhip in a direction too nearly perpendicular, which muſt of neceſſity looſen the anchor, ſo that the ſhip muſt drag it, in the ſea-phraſe, and, driving from her ſtation, be in danger of being wrecked on the firſt rocks, &c. whereas it is evident, that if the length of the cable be doubled, or tripled, the anchor will be dragged more horizontally, and bear a much greater force.

A ſecond advantage is, that, by having ſeveral cables at one another's ends, they will be leſs liable to break; for all the parts lying more upon a level, they will oppoſe the ſhocks of the ſea in a direction more perpendicular to the motions which the ſhip receives; whereas, when the cable is not long, it will be nearly vertical to the anchor, and therefore cannot bear ſuch a ſtrain: for it is evident,

that a ſhorter cable is charged with a greater effort, and ſhould therefore be ſtronger; otherwiſe it will only bear the ſame ſtrain in the proper direction, and will not be ſufficient in an horizontal direction, which is that in which the ſhip endeavours to drive.

The long cable will not be ſo apt to break as the ſhort one; becauſe it will bear a great deal more ſtretching before it comes to the greateſt ſtrain: otherwiſe, being ſhort, it muſt break at the firſt violent tug, becauſe it will not bear ſtretching; for a long cable may be compared to a ſort of ſpring, which may be very eaſily extended; and recovers its firſt ſituation, as ſoon as the force which extended it is removed. Beſides all this, a ſhip will ride much ſmoother with a long cable than with a ſhort one, and be leſs apt to plunge into the water; whereas, when a ſhip rides with a ſhort cable, as mariners have too often experienced, ſhe frequently pitches all the fore-part under water.

By what has been ſaid on this ſubject, we may ſee how very neceſſary it is to furniſh a ſhip with ſufficiency of cables, or what is called ground-taicling; and what an inconſiderate policy it is in merchants to ſubject their veſſels to ſuch evident dangers, from the want of them: for we may venture to aſſert, without violation of truth, that many good ſhips have been loſt, within our own remembrance, only on account of a deficiency in this article.

CABLE is likewiſe a general name given to all large ropes which ſerve to raiſe heavy loads by means of cranes, pullies, and other engines; as in bridges of boats: it is ſeldom given to a rope of leſs than three inches diameter.

The number of threads each cable is compoſed of, being always proportioned to its length and thickneſs, its weight and value are determined by this number of threads: thus a cable of ten inches in circumference ought to conſiſt of four hundred and eighty-five threads, and weigh one thouſand nine hundred and forty pounds; and on this foundation is calculated the following table, very uſeful for all perſons engaged in marine commerce, who equip merchant-ſhips on their own account, or freight them for the account of others.

A Table of the number of threads and weight of cables of different circumferences.

Circumference in inches.	Threads, or rope-yarns.	Weight in pounds.
9	393	1572
10	485	1940
11	598	2392
12	699	2796
13	821	3284
14	952	3808
15	1093	4372
16	1244	4976
17	1404	5616
18	1574	6296
19	1754	7016
20	1943	7772

Serve the CABLE, is to bind it round with ropes, leather, or other materials, to prevent it from being galled or fretted in the hawſe by friction. See HAWSE.

Splicing the CABLE, is interweaving the ends of the ſtrands of two cables together, or of one that had been broke.

Pay away the CABLE, is to let more run out of the ſhip, that ſhe may ride eaſier.

CABLED, in heraldry, a term applied to a croſs, formed of the two ends of a ſhip's cable; ſometimes alſo to a croſs covered over with rounds of rope, more properly called a croſs-corded.

CABOCHED, in heraldry, is when the heads of beaſts are borne without any part of the neck, full-faced.

CACALIA, foreign coltsfoot, in botany, a genus of ſyngeneſious plants, producing compound flowers: one of the ſpecies grows naturally in Auſtria, and on the mountains in Switzerland; this hath a fleſhy root, which ſpreads in the ground, from which ſprings up many leaves, ſtanding on ſingle foot-ſtalks, and are ſhaped like thoſe of ground-ivy, but are of a thicker texture, of a ſhining green on their upper-ſide, but white underneath; between theſe ariſe the ſtalk, which is round, branching towards the top, and grows to about a foot and a half high; under each diviſion of the ſtalk is placed a ſingle leaf of the ſame form as thoſe below, but much ſmaller: the branches are terminated by purpliſh flowers, growing in a ſort of umbel; theſe are erect, tubulous, funnel-ſhaped, and cut at the top into five ſegments, and are ſucceeded by oblong ſeeds, crowned with down.

To this genus Linnæus has added the cacalian-themum, tithymaloides, and porophyllum of other authors.

CACAO, the chocolate-tree, in botany, a genus of trees, called by Linnæus theobroma. See THEOBROMA.

The fruit of this tree is an oblong, roundiſh nut, nearly of the ſhape of an almond, but larger: the ſhell is dark-coloured, brittle, and thin: the kernel is both externally and internally browniſh, divided into ſeveral unequal portions, which are joined firmly together. It is the produce of a ſmall American tree, bearing a large red fruit, ſhaped like a cucumber, which contains thirty or more of the nuts. There are ſeveral ſorts of theſe nuts in the ſhops, diſtinguiſhed by their ſize, and the places whence they are brought: the larger kind, from the province of Nicaragua in Mexico, is moſt eſteemed.

Cacao-

the worſt ſort of all, and are ſold by the piece from one to two piaſters per carpet.

CADET, a military term, denoting a young gentleman who chooſes to carry arms in a marching regiment, as a private man. His views are to acquire ſome knowledge in the art of war, and to obtain a commiſſion in the army. Cadet differs from volunteer, as the former takes pay, whereas the latter ſerves without any pay.

CADI, or CADHI, a judge of civil affairs in the Turkiſh empire.

It is generally taken for the judge of a town, judges of provinces being diſtinguiſhed by the appellation of mollas.

In Biledulgerid, in Africa, the cadi decides in ſpiritual affairs.

CADILESCHER, a capital officer of juſtice, among the Turks, anſwering to a chief juſtice among us.

CADMIA, in the natural hiſtory of the ancients, the name of two diſtinct ſubſtances, called native cadmia, and factitious cadmia. The native cadmia was only one of the copper ores; the factitious cadmia was a recrement of copper, produced in the copper works.

Among the modern writers, it is not unuſual to confound theſe ſubſtances with tutty. See the article TUTTY.

CADUCEUS, in antiquity, Mercury's rod, or ſceptre, being a wand entwiſted by two ſerpents, borne by that deity, as the enſign of his quality and office, given him, according to the fable, by Apollo, for his ſeven-ſtringed harp.

CÆCILIA, in zoology, the name of a genus of ſerpents, the characters of which are theſe: the body is naked, with wrinkled ſides; the upper lip is prominent beyond the reſt of the mouth, and has two tentacula; but no tail.

Of this genus, authors enumerate ſeveral ſpecies, diſtinguiſhed by the number of their rugæ or wrinkles.

CÆCUM, or COECUM, in anatomy, the blind gut, or firſt of the thick inteſtines. Of the three large inteſtines, called, from their ſize, inteſtina craſſa, the firſt is the cæcum, ſituated at the right os ileum; it reſembles a bag, and has a vermiform or worm-like appendage fixed to it. It begins at the termination of the ileum, and terminates in the bottom of the bag, or ſaculus, which it forms: its length is no more than three or four fingers breadth. In the appendage, or opening into the ſide of the cæcum, there are ſome glands, which, together with its erect ſituation, ſeems to ſhew that ſome fluid is ſecreted there. In hens, this is double; as alſo in many other fowls. In fiſhes, there are frequently a vaſt number of them; and in ſome ſpecies not leſs than four hundred. In man it is, at the utmoſt, ſingle, and is often wanting.

CÆMENT. See CEMENT.

CÆMENTATION. See CEMENTATION.

CÆSALPINA, a decandrious tree, which produces very ſlender branches, armed with recurent thorns; the leaves are winged, branching out into many diviſions, each being furniſhed with ſmall oval lobes, indented at the top, and placed oppoſite; the foot-ſtalks of the flowers come out from the ſide of the branch, and are terminated by a looſe pyramidical ſpike of white flowers; each of theſe have a quinquefid cup, which contains five ringent petals: the fruit is an oblong, acuminated, unilocular cell, incloſing ſeveral compreſſed oval ſeeds. This tree affords the braſiletto wood, ſo called, which is much uſed in dying; it grows naturally in the warmeſt parts of America, from whence the wood is imported for the dyers; but the demand has been ſo great of late years, that in the Britiſh colonies the biggeſt tree ſcarce exceeds eight inches in diameter, and fifteen feet in height.

CÆSAR, in Roman antiquity, a title borne by all the emperors, from Julius Cæſar to the deſtruction of the empire. It was alſo uſed as a title of diſtinction, for the intended or preſumptive heir of the empire, as king of the Romans is now uſed for that of the German empire.

This title took its riſe from the ſurname of the firſt emperor, C. Julius Cæſar, which, by a decree of the ſenate, all the ſucceeding emperors were to bear. Under his ſucceſſor, the appellation of Auguſtus being appropriated to the emperors, in compliment to that prince, the title of Cæſar being given to the ſecond perſon in the empire, though ſtill it continued to be given to the firſt; and hence the difference betwixt Cæſar uſed ſimply, and Cæſar with the addition of Imperator Auguſtus.

CÆSARIAN SECTION, in midwifry, a chirurgical operation, by which the fœtus is delivered from the womb of its mother, when it cannot be done in the natural way.

There are chiefly three different caſes in which this operation is practicable; the firſt is, when the mother is dead, either in the birth, or by ſome accident, while the fœtus is reaſonably ſuppoſed to be yet ſurviving in the womb: the ſecond is, when the mother is living, and the fœtus dead, but incapable of being extracted or expelled by the natural paſſages: the third and laſt is, when the mother and fœtus are both living, but the latter is incapable of being brought into the world through the natural paſſages.

In the firſt caſe, this operation ſhould be performed, not only as ſoon as poſſible, but even before the circulation in the mother is ſtopped, becauſe the fœtus cannot long ſurvive: then the abdomen muſt be laid open, by a crucial inciſion, as in common diſſections, or by making a longitudinal inciſion on one ſide; and if the fœtus ſhould have fallen into the cavity of the abdomen, from a rupture of the uterus, &c. it ſhould be taken out immediately; but if

if it remains concealed in the womb, that body ſhould be cautiouſly opened, and the fœtus extracted.

In the ſecond caſe, the ſurgeon muſt make a longitudinal inciſion on the outſide of the rectus muſcle, between the navel and the angle of the os ilium, and thereby extract the fœtus. If the fœtus is contained in the Fallopian tube, or in the ovary, thoſe parts are to be opened, and the fœtus, with its placenta, then removed: but if the fœtus is concealed in the uterus, this is alſo to be opened, by a longitudinal inciſion, ſufficient to give a paſſage to the fœtus, and its appendages.

In the third and laſt caſe, when the birth is prevented by a calloſity of the vagina, or ſomething amiſs in the mouth of the uterus, a diviſion and dilatation of theſe parts is preferable to the Cæſarian ſection, as leſs dangerous; and the ſame may be ſaid when the vagina is obſtructed by the hymen, or ſome other preternatural membrane: but when the calloſity of the vagina is ſo large and hard, as to render the birth that way impracticable, if it was to be divided, there is no other means left but the Cæſarian ſection. If a rupture of the uterus ſhould be made in the agonies of labour, ſo as to let out the fœtus into the cavity of the abdomen, in this caſe it will be neceſſary to make an inciſion in that part made moſt prominent by the fœtus, which ſhould be extracted, as before.

CÆSTUS, in antiquity, a large gauntlet made of raw hide, which the wreſtlers made uſe of when they fought at the public games.

This was a kind of leathern ſtrap, ſtrengthened with lead, or plates of iron, which encompaſſed the hand, the wriſt, and a part of the arm, as well to defend theſe parts as to enforce their blows.

CÆSTUS, or CÆSTUM, was alſo a kind of girdle made of wool, which the huſband untied for his ſpouſe the firſt day of marriage, before they went to bed.

This relates to Venus's girdle, which Juno borrowed of her, to entice Jupiter to love her. See the article CESTUS.

CÆSURA, in the ancient poetry, is when, in the ſcanning of a verſe, a word is divided, ſo as one part ſeems cut off, and goes to a different foot from the reſt; as

Menti | ri no | li, nun | quam men | dacia | profunt.
Where the ſyllables *ri*, *li*, *quam*, and *men*, are cæſuras.

CÆSURA more properly denotes a certain and agreeable diviſion in the words between the feet of a verſe, whereby the laſt ſyllable of a word becomes the firſt of a foot; as in

Arma virumque cano, trojæ qui primus ab oris.
Where the ſyllables *no* and *jæ* are cæſuras.

CÆSURA, in the modern poetry, denotes a reſt, or pauſe, towards the middle of an Alexandrine verſe, by which the voice and pronunciation are aided, and the verſe, as it were, divided into two hemiſtichs.

In Alexandrine verſe of twelve or thirteen ſyllables, the cæſure muſt always be on the ſixth; in thoſe of ten, on the fourth; and in thoſe of twelve, on the ſixth: verſes of eight ſyllables muſt not have any cæſure.

CÆTERIS PARIBUS, a Latin term, often uſed by mathematical and phyſical writers; the words literally ſignifying the reſt, or the other things, being alike, or equal. Thus we ſay, the heavier the bullet, *cæteris paribus*, the greater the range; that is, by how much the bullet is heavier, if the length and diameter of the piece, and the quantity and ſtrength of the powder be the ſame, by ſo much will the utmoſt range or diſtance of a piece of ordnance be greater.

Thus alſo, in a phyſical way, we ſay, the velocity and quantity of the blood, circulating, in a given time, through any ſection of an artery, will, *cæteris paribus*, be according to its diameter, and diſtance from the heart.

CAFFA, in commerce, painted cotton cloths manufactured in the Eaſt-Indies, and ſold at Bengal.

CAG, or KEG, of ſturgeon, &c. a barrel or veſſel that contains from four to five gallons.

CAHYS, a dry meaſure for corn, uſed in ſome parts of Spain, particularly at Seville and at Cadiz. It is near a buſhel of our meaſure.

CAIMACAN, or CAIMACAM, in the Turkiſh affairs, a dignity in the Ottoman empire, anſwering to lieutenant, or rather deputy, among us.

There are uſually two caimacans, one reſiding at Conſtantinople, as governor thereof; the other attending the grand vizir, in quality of his lieutenant, ſecretary of ſtate, and firſt miniſter of his council; and gives audience to ambaſſadors. Sometimes there is a third caimacan, who attends the ſultan; whom he acquaints with any public diſturbances, and receives his orders concerning them.

CAINIANS, or CAINITES, in church hiſtory, Chriſtian heretics, that ſprung up about the year 130, and took their name from Cain, whom they looked upon as their head and father: they ſaid that he was formed by a celeſtial and Almighty power, and that Abel was made but by a weak one.

This ſect adopted all that was impure in the hereſy of the Gnoſtics, and other heretics of thoſe times: they acknowledged a power ſuperior to that of the Creator; the former they called wiſdom; the latter inferior virtue: they had a particular veneration for Korah, Abiram, Eſau, Lot, the Sodomites, and eſpecially Judas, becauſe his treachery occaſioned the death of Jeſus Chriſt: they even made uſe of a goſpel, which bore that falſe apoſtle's name.

CAISSON,

CAISSON, in the military art, a wooden cheſt, into which ſeveral bombs are put, and ſometimes only filled with gunpowder: this is buried under ſome work, whereof the enemy intends to poſſeſs themſelves; and when they are maſters of it, it is fired, in order to blow them up.

CAISSON is alſo uſed for a wooden frame, or cheſt, uſed in laying the foundations of the piers of a bridge.

CALABA, Indian maſtich-tree, in botany, a genus of trees, whoſe characters are: it has a roſaceous flower, conſiſting of ſeveral petals, which are placed in a circular order; from whoſe flower-cup ariſes the pointal, which afterwards becomes a ſpherical fleſhy fruit, including a nut of the ſame form.

This tree grows to a great magnitude in the warm parts of America, where it is a native. From the trunk and branches there iſſue out a clear gum, ſomewhat like the maſtich, from whence it received its name; the gum being uſed in thoſe countries as maſtich.

At preſent this tree is pretty rare in England, it being ſo tender as not to bear the open air: ſo that it muſt be preſerved in ſtoves, with the moſt tender exotic plants. It is propagated by the nuts, which are frequently brought from America; theſe ſhould be planted in ſmall pots, filled with freſh light earth, and plunged into an hot-bed of tanners bark, obſerving to water the pots frequently, to forward the vegetation of the nuts, which, having hard ſhells, are pretty long before they break their covers, unleſs they have a good ſhare of heat and moiſture. When the plants are come up about two inches high, they ſhould be carefully tranſplanted, each into a ſeparate ſmall pot, filled with freſh light earth, and plunged into a moderate hot-bed of tanners bark, obſerving to water and ſhade them till they have taken new root; after which time they ſhould have air admitted to them, in proportion to the heat of the weather, and the bed in which they are placed; and they muſt be frequently watered in warm weather. In this bed they may remain during the ſummer-ſeaſon; but at Michaelmas they ſhould be removed into the bark-ſtove, and placed in a warm ſituation. During the winter-ſeaſon theſe plants will require water pretty often; but it ſhould not be given to them in large quantities, eſpecially in cold weather, leſt it rot the fibres of their roots. As the plants advance, they muſt be ſhifted into larger pots, and treated in the ſame manner as the coffee-tree. See the article COFFEE-TREE.

With this management the plant will thrive very well; and as the leaves of this plant are long, ſtrong, and of a ſhining green colour, they make a pretty appearance in the ſtove, with other tender exotic plants. *Miller's Gard. Dict.*

CALABASH, in botany, a ſpecies of melopepo, or cucurbita. See CUCURBITA.

CALABASH-*Tree*, the ſame with the creſcentia of Linnæus.

CALADE, in the manege, the deſcent or ſloping declivity of a riſing manege ground, being a ſmall eminence upon which we ride down a horſe ſeveral times, putting him to a ſhort gallop, with his fore hams in the air, to make him learn to ply or bend his haunches, and form his ſtop upon the aids of the calves of the legs, the ſtay of the bridle, and the caveſon, ſeaſonably given.

CALAMANCO, a ſort of woollen ſtuff manufactured in England and in Brabant. It has a fine gloſs, and is chequered in the warp, whence the checks appear only on the right ſide. Some calamancos are quite plain, others have broad ſtripes adorned with flowers; ſome with plain broad ſtripes, ſome with narrow ſtripes, and others watered.

CALAMBA, or CALAMBAC-WOOD, the beſt kind of lignum-aloes.

CALAMIFEROUS, among botaniſts, the ſame with culmiferous. See the article CULMIFEROUS.

CALAMINARIS, or LAPIS CALAMINARIS, in natural hiſtory, a mineral ſubſtance, of a greyiſh, browniſh, yellowiſh, or pale reddiſh colour, and ſometimes of all theſe colours variouſly mixed; conſiderably heavy, and moderately hard, but never ſufficiently ſo as to ſtrike fire with ſteel; when mixed with powdered charcoal, changing copper, by fuſion, into a yellow metal called braſs. It is found plentifully in England, Germany, and other countries, either in diſtinct mines, or intermingled with the ores of lead or other metals.

CALAMINT, *Calamintha*, in botany, a diſtinct genus of plants, with ſquare ſtalks; the leaves ſet in pairs; and the flowers on branched pedicles, whereof two iſſue from one joint in the boſoms of the leaves: the upper lip of the flower is divided into two ſegments, the lower lip into three. It is perennial, and flowers in June and July. There are three ſpecies of this plant uſed in medicine; namely,

1. Calamint, with reclining ſtalks; ſmall irregularly oval leaves, very ſlightly indented, without pedicles; and the flower-ſtalks longer than the leaves. This ſpecies grows wild in dry grounds, and by the ſides of fields.

It has a ſtrong aromatic ſmell, approaching to that of penny-royal; and a moderately pungent taſte, ſomewhat like that of ſpearmint, but warmer. In virtue, it appears to be nearly ſimilar to a mixture of thoſe herbs: infuſions of the leaves are drank as tea, in weakneſſes of the ſtomach, flatulent cholics, and uterine obſtructions.

Water extracts by infuſion nearly all the virtues of the calamint, and carries off, in evaporation, the whole of its ſpecific flavour. In diſtillation with water, there ſeparates from the aqueous fluid a conſiderable quantity of eſſential oil, of a very pungent taſte, and ſmelling ſtrongly of the herb. The

remaining decoction, thus divested of the aromatic part of the plant, is unpleasantly roughish, bitterish, and mucilaginous.

Rectified spirit extracts the virtues of the calamint more perfectly than water, and gains from it a deep green tincture. On gently distilling the filtered liquor, a part of the flavour of the herb rises with the spirit, and a part remains behind in the inspissated extract. Spirit manifestly brings over more from this plant than from spearmint, and less than from penny-royal; its active matter being more volatile than that of the one, and less so than that of the other.

2. Common calamint, with upright stalks; larger, short, serrated, pointed leaves, set on pedicles; and the flower-stalks of the length of the leaves. It is found wild about the sides of highways, but is less common in this country than the other.

The leaves of this species are in taste weaker than those of the preceding. Their smell is strong, not like that of penny-royal, but rather approaching to that of the wild mints, though more agreeable. The essential oils of the two plants differ in flavour as the herbs themselves: in the spirituous extracts the difference is less considerable. They are supposed to agree in virtue, and have been used indiscriminately; the shops being generally supplied with the species which is most easily procurable.

3. Mountain calamint, with larger leaves and flowers than the two preceding, but smaller stalks; the leaves set on pedicles, pointed, acutely and deeply serrated like those of nettles; the flower-stalks shorter than the leaves, and of the length of the flowers themselves. It is a native of the southern parts of Europe, and raised with us in gardens.

This species has a moderately pungent taste, and a more agreeable aromatic smell than either of the other calamints. It appears to be the most eligible of the three as a stomachic.

CALAMUS, in botany, a genus of hexandrious plants, producing apetalous flowers, which are composed each of an hexaphyllous persistent cup; in which is inserted six capillary filaments topped with round antheræ; the fruit is a globose membranaceous pericarpium of one cell, which contains a round fleshy seed.

CALAMUS Aromaticus, or Acorus Verus, in botany, the sweet-smelling flag, a plant which grows in marshy places in several parts of Europe. The leaves, which arise immediately from the root, are like those of the iris; they are sharp at the point, of a fine smooth, green colour, and about a quarter of an inch broad. The flowers are small, disposed in a compact spike, and cover the receptacle of fructification; each of these have a cylindrical spadix, in which is inserted six obtuse petals, with six crassiuscular filaments. The germen is gibbous and longish, without a style; but the stigma is a prominent point. The fruit is a short triangular obtuse capsule of three cells, which contains a number of ovato-oblong seeds. The root of this plant is used in medicine, and is oblong, geniculated, and a little compressed. When fresh, it is of a whitish green colour, but afterwards turns of a reddish yellow; it is white and spongy within, easy to break, and of a strong fragrant smell, with a sharp bitterish taste: it abounds with a volatile essential oil; it is said to be good to strengthen the stomach, discussing wind; the Indians use it in their sauces, and esteem it as a diuretic: the fume of it burnt with turpentine is recommended for diseases of the breast; and the Indian women, according to some, use it as an uterine and cephalic.

Calamus-Scriptorius, in antiquity, a reed or rush to write with.

The ancients made use of styles to write on tables covered with wax; and of reed, or rush, to write on parchment, or Egyptian paper.

Calamus-Scriptorius, in anatomy, a dilatation of the fourth ventricle of the brain; so called from its figure, which resembles that of a goose-quill.

CALANDRA, in ornithology, a name by which some call the great lark, without any crest.

CALASH, or Calesh, a light and very low kind of chariot, used chiefly for taking the air in parks and gardens.

Knights of CALATRAVA, a military order in Spain, instituted under Sancho III. king of Castile, upon the following occasion. When that prince took the strong fort of Calatrava from the Moors of Andalusia, he gave it to the Templars, who wanting courage to defend it, returned it him again. Then Don Reymond, of the order of the Cistercians, accompanied with several persons of quality, made an offer to defend the place, which the king thereupon delivered up to them, and instituted that order. It increased so much under the reign of Alphonsus, that the knights desired they might have a grand master, which was granted. Ferdinand and Isabella afterwards, with the consent of pope Innocent VIII. re-united the grand mastership of Calatrava to the Spanish crown; so that the kings of Spain are now become perpetual administrators thereof.

The knights of Calatrava bear a cross gules, fleurdelised with green, &c. their rule and habit was originally that of the Cistercians.

CALCANEUM, or Os Calcis, in anatomy, the bone lying under the astragalus, to which, and the os cuboides, it is articulated. Its apophysis behind serves to prevent our falling backward, and on its posterior surface is inserted the tendo achillis; in its interior side there is an excavation, intended to give safe passage to the vessels running to the metatarsus and toes.

CALCAR, in anatomy, the same with calcaneum. See the article CALCANEUM.

CALCAR, in glass-making, a sort of oven, or reverberatory furnace, in which, being well heated, the crystal frit, or bollito, is made.

CALCARIOUS, in general, denotes something belonging to, or partaking of, the nature of calx. See the article CALX.

CALCARIUS LAPIS, in natural history, the same with lime-stone. See LIME.

CALCEDON, among jewellers, denotes a flaw or foul vein, like chalcedony, found in some precious stones.

CALCEDONY, or CHALCEDONY, in the history of precious stones. See the article CHALCEDONY.

CALCINATION, in chemistry, the separating, by means of heat or fire, the more fixed from the volatile parts of any compound body.

CALCULATION, the act of computing several sums, by adding, subtracting, multiplying, or dividing. See the articles ARITHMETIC, ADDITION, &c.

CALCULATION is more particularly used to signify the computations in astronomy and geometry, for making tables of logarithms, ephemerides, finding the time of eclipses, &c. For the calculation of clock and watch-work, see CLOCK and WATCH-WORK.

CALCULUS, in natural history, properly denotes a little stone or pebble. See the article PEBBLE.

CALCULUS, or CALCULUS-HUMANUS, in medicine, the stone in the bladder or kidneys. See the article STONE.

CALCULUS *Differentialis*, is the arithmetic of infinitely small differences between variable quantities, which in England we call fluxions. The calculus differentialis therefore, and fluxions, are the same thing under different names; the latter given by Sir Isaac Newton, and the former by Mr. Leibnitz, who disputes with Sir Isaac the honour of the discovery.

Mr. Leibnitz, about 1676, by most foreigners is allowed to have first invented this doctrine of infinite small quantities, who called it the *calculus differentialis*; but it is plain, from Sir Isaac's papers, that Sir Isaac was the first inventor of it, who being too free in communicating it to Mr. Leibnitz, he stole it from him; and that the suspicion might be the less, he invented different words and notes from those in Sir Isaac's method; for instead of putting the fluxion of x thus, $\dot{x}$, he puts it thus, dx; and for y, dy, instead of $\dot{y}$; and these are used by almost all foreigners.

Yet even James Bernoulli, in the Leipsick acts for January 1691, acknowledges, that our famous Dr. Barrow (before Sir Isaac Newton, or M. Leibnitz either) had given some specimens of this method above ten years before that date, in his geometrical lectures, and of which all his apparatus of propositions there contained are so many examples.

He also acknowledges that Mr. Leibnitz's method of *calculus differentialis*, is founded on Dr. Barrow's, and differs from it only in some notes and compendious abridgments. See FLUXIONS.

CALCULUS *Exponentialis*, among mathematicians, a method of differencing exponential quantities, and summing up the differentials of the same. By an exponential quantity is meant a power, the exponent of which is variable; as y^y, c^x. In order to difference an exponential quantity, nothing more is required than to reduce the exponential quantities to logarithmic ones, upon which the differencing is managed in the same manner as logarithmic ones.

CALCULUS *Integralis*, is the method of finding, from a differential quantity given, the quantity from whose differencing the differential results. But in England we understand the method of finding the proper flowing quantity of any given fluxion to be the *calculus integralis*, and is the reverse of the calculus differentialis, which in England is to find the fluxion from the flowing quantity.

CALCULUS *Specialis*, or *Literalis*, the same as algebra. See ALGEBRA.

CALE, or KALE. See CABBAGE.

Sea CALE. See CRAMBE.

CALEA, in botany, a genus of syngenesious plants, whose flower is uniform and funnel-shaped, cut at the extremity into five parts, and contains five very short capillary filaments, topped with tubulose cylindrical antheræ; it is destitute of a pericarpium, but the calyx contains a single oblong seed topped with down.

CALEFACTION, the production of heat in a body from the action of fire, or that impulse impressed by a hot body upon other bodies about it. This word is used in pharmacy, by way of distinction from coction, which implies boiling; whereas calefaction is only heating a thing.

CALENDAR, or ALMANACK, is a political distribution of time, accommodated to the uses of life, and taken from the motions of the heavenly bodies. Of this kind are those annual books, wherein the days of the month, the festivals, the sign the sun is in, the sun's rising and setting, the changes of the moon, &c. are exhibited, which we also call almanacks. But the word calendar seems to come from the word *calendæ*, which amongst the Romans signifies the first days of every month.

The first calendar among the Romans was constructed by Romulus, who, being ignorant of the science of astronomy, supposed the sun to make its annual revolution in three hundred and four days, and therefore divided the year into ten months only, beginning on the first day of March. But Numa Pompilius, who added two months more, viz. January and February, placed them before March. His year consisted of three hundred and sixty-five days.

days. This was afterwards improved by Julius Cæsar, with the help of Sosigenes, a celebrated astronomer of those times, who found that the dispensation of time in the calendar could never be settled on any sure footing, without having regard to the annual course of the sun. Accordingly he observed the sun's annual revolution to be performed in three hundred and sixty-five days, six hours; therefore he reduced the year to the same number of days, which was retained in most Protestant countries, and in our nation till the year 1752. This correction, or Julian calendar, disposes the year into quadriennial periods, whereof the first three years, which were called common, consisted of three hundred and sixty-five days, and the fourth, called Bissextile, of three hundred and sixty-six, by reason of the six hours, which in four years make a day, or somewhat less; for in one hundred and thirty-four years an intercalary day is to be retrenched. On this account it was that pope Gregory XIII. with the advice of Clavius and Caiconius, appointed that the hundredth year of each century should have no Bissextile, excepting each fourth century: that is, a subtraction of three Bissextile days is made every four centuries, by reason of the eleven minutes wanting of the six hours, whereof the Bissextile consists. See BISSEXTILE.

Julian Christian CALENDAR, is that wherein the days of the week are determined by the letters A, B, C, D, E, F, G; by means of the solar cycle, and the new and full moons, especially the Paschal full moon, with the feast of Easter, and the other moveable feasts depending thereon, by means of golden numbers rightly disposed through the Julian year. See GOLDEN NUMBER.

Gregorian CALENDAR, that which, by means of epacts rightly disposed through the several months, determines the new and full moons, and the time of Easter, with the moveable feasts depending thereon in the Gregorian year. See EPACT.

Reformed, or corrected CALENDAR, is that which, setting aside golden number, epacts, and dominical letters, determines the equinox with the Paschal full moon, and the moveable feasts depending thereon, by astronomical computations, according to the Rudolphine tables, or any other tables that are more correct. This calendar was introduced among the Protestant states of Germany in the year 1700, when eleven days were at once thrown out of the month of February, by which the corrected style agrees with the Gregorian.

Astronomical CALENDAR, an instrument engraved upon copper plates, printed on paper, and pasted on board, with a brass slider, which carries a hair, and shews by inspection the sun's meridian altitude, right ascension, declination, rising, setting, amplitude, &c. to as great exactness as our common globes. For the construction of calendar or almanack, see EPHEMERIDES.

CALENDER, in mechanics, a machine used in manufactories, to press certain woollen and silken stuffs, and linens, to make them smooth, even, and glossy, or to give them waves, or water them, as may be seen in mohairs and tabbies. This instrument is composed of two thick cylinders or rollers of very hard and polished wood, round which the stuffs to be calendered are wound: these rollers are placed crosswise, between two very thick boards; the lower serving as a fixed base, and the upper moveable by means of a thick screw, with a rope fastened to a spindle, which makes its axis: the uppermost board is loaded with large stones cemented together, weighing twenty thousand pounds or more. It is this weight that gives the polish, and makes the waves of the stuffs about the roller, by means of a shallow indenture, or engraving cut in it. At Paris there is an extraordinary machine of this kind, called the royal calender, made by order of Mr. Colbert; the lower table or base of which is made of a block of smooth marble, and the upper lined at bottom with a plate of smooth polished copper.

CALENDS, *Calendæ*, in Roman chronology, is what the Romans called the first days of every month, from the Greek word καλεω, or *caleo*, to call; because, anciently counting their months by the motion of the moon, there was a priest appointed to observe the time of the new moon; who, having seen it, gave notice to the president over the sacrifices, and he called the people together, and declared to them how they must reckon the days until the nones, pronouncing the word *caleo* five times, if the nones did happen on the fifth day; or seven times, if they happened on the seventh day of the month. This is the account given by Varro: but others derive the appellation hence; that the people being convened on this day, the pontifex called or proclaimed the several feasts or holy-days in the month, a custom which continued no longer than the year of Rome 450, when C. Flavius, the curule edile, ordered the fasti, or calendar, to be set up in public places, that every body might know the difference of times and the return of the festivals. The Roman method of reckoning the days of their months is backwards, or in retrograde order, as is expressed in the following lines:

Prima dies mensis cujusque est dicta calendæ:
Sex Maius, nonas, Julius, October, & Mars;
Quatuor at reliqui: habet idus quilibet octo;
Inde dies reliquos omnes dic esse calendas;
Quas retro numerans, dice a mense sequente.

Hence to find the day of our month answering to that of the calends:

To the number of days in the preceding month add two, and from this sum subtracting the number of calends given, and the remainder will be the day

day of our month: thus the fourth of the calends of June is found to anſwer to the twenty-ninth of May; and ſo in other caſes.

CALENDULA, marygold, in botany, a genus of plants producing compound radiated flowers. There are divers ſpecies of this genus; the common marygold has a root divided into many thick fibres or branches, the ſtalks are ſlender, a little angular, hairy, and clammy to the touch. It is divided into many branches, and furniſhed with oblong leaves, joined cloſe to the ſtalk, widening from thence to the extremity, and of a light green colour. The flowers grow on the extremities of the branches, and are of a radiated orange colour; each of theſe conſiſt of hermaphrodite and female florets, included in a ſingle empalement: the hermaphrodite are tubuloſe, and ſemiquinquifid; and the female florets, which compoſe the rays, are long, ligulated, and cut in three ſegments at the extremity: there are no central ſeed in the diſk; thoſe of the periphery are ſometimes ſolitary, and are large, oblong, membranaceous, and cordated. This plant is annual, common in gardens, propagates itſelf by ſeeds, and flowers from May till autumn. The flowers of this plant are ſaid to be aperient and diſſolvent, and reckoned good in uterine obſtructions, and icteric diſorders; and, infuſed in wine, they will open a ſlight obſtruction of the liver, and cure a ſuppreſſion of the menſes. To this genus Linnæus has added the caltha, dimorphotheca, and cardiſpermum of other authors.

CALENTURE, *Calentura*, in medicine, a feveriſh diſorder incident to ſailors in hot climates; the principal ſymptom of which is, their imagining the ſea to be green fields: hence, attempting to walk abroad in theſe imaginary places of delight, they are frequently loſt.

Vomiting, bleeding, a ſpare diet, and the neutral ſalts, are recommended in this diſorder: a ſingle vomit commonly removing the delirium, and the cooling medicines completing the cure.

CALF, *Vitulus*, in zoology, the young of the ox kind.

Among ſportſmen, the term calf is uſed for a hart or hind of the firſt year. The ſame term is alſo uſed for the young of the whale.

There are two ways of breeding calves; one, when they are allowed to ſuck their dams all the year round, chiefly uſed in countries where paſture is cheap; and the other, when being taken from their dams after ſucking a fortnight, they are taught to drink milk, or milk and water, out of a tub. The former, however, of theſe methods is allowed to make the beſt cattle.

CALF's-SNOUT, in botany. See ANTIRRHINUM.

CALIBER, or CALIPER, properly denotes the diameter of any body: thus we ſay, two columns of the ſame caliber, the caliber of the bore of a gun, the caliber of a bullet, &c. See CANNON, &c.

CALIBER-COMPASSES, the name of an inſtrument, made either of wood, iron, ſteel, or braſs: that uſed for meaſuring bullets conſiſts of two branches, bending inwards, with a tongue fixed to one of them, and the other graduated in ſuch a manner, that if the bullet be compreſſed by the ends of the two branches, and the tongue be applied to the graduated branch, it will ſhew the weight of the bullet.

CALIBER alſo ſignifies an inſtrument uſed by carpenters, joiners, and bricklayers, to ſee whether their work be well ſquared.

CALIDUCT, in antiquity, a kind of pipes, or canals, diſpoſed along the walls of houſes and apartments, uſed, by the ancients, for conveying heat to ſeveral remote parts of the houſe, from one common furnace.

CALIPH, the ſupreme eccleſiaſtical dignity among the Saracens; or, as it is otherwiſe defined, a ſovereign dignity among the Mahometans, veſted with abſolute authority in all matters relating both to religion and policy.

It ſignifies in the Arabic ſucceſſor, or vicar: the Saracen princes aſſumed this title as deſcendants from Mahomet, the caliphs bearing the ſame relation to Mahomet the popes pretend they do to Jeſus Chriſt, or St. Peter. It is at this day one of the grand ſeignor's titles, as ſucceſſor of Mahomet; and of the ſophi of Perſia, as ſucceſſor of Ali.

CALIXTINS, in church hiſtory, a ſect of Chriſtians in Bohemia and Moravia: the principal point in which they differed from the church, was the uſe of the chalice, or communicating in both kinds.

CALIXTINS is alſo a name given to thoſe among the Lutherans who follow the ſentiments of George Calixtus, a celebrated divine, who oppoſed the opinion of St. Auguſtine on predeſtination, grace, and free-will.

CALKING, in ſhip-building, the act of driving a quantity of oakum, *i. e.* old ropes untwiſted and drawn aſunder, into the ſeams of the planks, or into the intervals between the edges of the planks on a ſhip's decks or ſides, to keep out the water. After the oakum is driven very hard into theſe ſeams, it is covered with hot-melted pitch, to prevent the water from rotting it.

Amongſt the ancients, the firſt who made uſe of pitch in calking were the inhabitants of Phæacia, afterwards called *Corſica*. Wax and roſin appear to have been commonly uſed previous to that period; and the Poles uſe a ſort of clay for this purpoſe on their rivers at this day. See the article *Ship*-BUILDING.

CALKINS, the prominent parts at the extremities of a horſe-ſhoe, bent downwards, and forged to a ſort of point.

Calkins are apt to make horſes trip: they alſo occaſion

occaſion blymes, and ruin the back ſinews. If faſhioned in form of a hare's ear, and the horn of a horſe's heel be pared a little low, they do little damage; whereas the great ſquare calkins quite ſpoil the foot.

Calkins are either ſingle or double; that is, at one end of the ſhoe, or at both: theſe laſt are deemed leſs hurtful, as the horſe can tread more even.

CALICO, or CALLICO, a kind of linen manufacture, made of cotton, chiefly in the Eaſt-Indies. There is a great trade in the province of Bengal, in this commodity, which is tranſported in prodigious quantities in Perſia, Turkey, Arabia, Muſcovy, and all over Europe. Some of them are painted with flowers of various colours; and the women in the Indies make veils and ſcarfs of them, and, of ſome, coverlets for beds, and handkerchiefs. They make another ſort of this manufacture, which they never dye, and hath a ſtripe of gold and ſilver quite through the piece; and at each end, from the breadth of one inch to twelve or fifteen, they fix a tiſſue of gold, ſilver, and ſilk, intermixed with flowers: both ſides are alike. They make alſo other ſorts of cotton cloths at Brampour, becauſe there is no other province in all the Indies which has greater quantities of cotton.

At Seconge they are ſaid to make the beſt ſorts of calicoes; in all other parts the colours are neither ſo lively nor laſting, but wear out with often waſhing; whereas thoſe made at Seconge grow the fairer the more you waſh them. This is ſaid to ariſe from a peculiar virtue of the river that runs by the city, when the rain falls; for the workmen, having made ſuch prints upon their cottons as the foreign merchants give them, by ſeveral patterns, dip them into the river often, and that ſo fixes the colours, that they will always hold. There is alſo made at Seconge a ſort of calico ſo fine, that when a perſon puts it on, his ſkin ſhall appear as plainly through it as if he was quite naked; but the merchants are not permitted to tranſport it; for the governor is obliged to ſend it all to the Great Mogul's ſeraglio, and the principal lords of the court, to make the ſultaneſſes and noblemen's wives ſhifts, and garments for hot weather.

The city of Baroche alſo is very famous for trade, on account of the river, which has a peculiar quality to whiten their calicoes, and which are, therefore, brought from all parts of the mogul's territories thither for that end.

This manufacture is brought into this nation by the Eaſt-India company, which is re-exported by private merchants to other parts of Europe and America.

CALICO-*Printing*, the art of ſtaining calicoes, &c. of various colours. See LINEN-*Printing*.

CALL, amongſt ſailors, a ſort of whiſtle or pipe made of ſilver or braſs, uſed by the boatſwain and his mates, to ſummon the ſailors to their duty, and direct them in the various work of the ſhip, which they are taught to obey, by different ſtrains of the call, as ſoldiers are directed by the drum, to march, retreat, charge, &c.

The principal articles which are commanded by this inſtrument, are, heaving round the capſtern, veering away the cable, hoiſting, lowering, belaying, &c. nor would ſuch orders be heard without the call, on account of the bacchanalian clamour commonly made by ſailors in ſuch exerciſes, which would be impenetrable even to the boatſwain's voice, although that indeed is more barbarous and dreadful than can be eaſily conceived.

We occaſionally remarked, in the article BOATSWAIN, that his voice was extremely ſimilar to the bray of an aſs; but if any of our readers have heard the alternate roaring and whiſtling of that officer, they muſt naturally perceive that there is a moſt perfect ſympathy between them; the latter of which ſeeming emulous, at every time he draws breath, when braying, to imitate the ſound of the call. Indeed, if the Pythagorean ſyſtem of tranſmigration were not exploded, and that our orthodoxy might therefore be queſtioned, we ſhould not make the leaſt ſcruple to believe, that the body of that ſagacious beaſt is animated by the ſoul of a dead boatſwain.

CALLA, the African arum, in botany, a gynandrious plant with a thick fleſhy tuberoſe root, which is covered with a thin brown ſkin, with many fibres ſtriking into the ground. The leaves are green and ſucculent, arrow-ſhaped, reflexed at the point, and are about eight or nine inches in length; theſe ſtand on footſtalks about a foot long, and ariſe from the root in cluſters. Between the leaves ſpring forth the footſtalk of the flower, which is thick, ſmooth, of the ſame colour of the leaves riſing above them, and terminated with a ſingle flower, ſhaped like thoſe of the arum; the hood or ſpatha being twiſted at the bottom, but ſpreads open at the top, and is of a pure white colour. In the center of this is ſituated the ſpadix or club, which is of an herbaceous yellow colour, upon which the ſmall flowers are placed, and ſo cloſely joined, as that the male and female party are very difficult to be diſtinguiſhed: when theſe decay, part of thoſe which are ſituated at the top of the club, are ſucceeded by roundiſh fleſhy berries compreſſed on two ſides, each containing two or three obtuſe ſeeds. This plant flowers in May, and the ſeeds are ripe in Auguſt; it propagates very faſt by offſets, and grows naturally at the Cape of Good Hope.

CALLICARPA, in botany, a bacciferous ſhrub which grows plentifully in the woods of Carolina; it riſes from four to ſix feet high, ſending out many branches from the ſide, which are woolly when young, and furniſhed with oval lanceolated leaves, placed oppoſite in pairs, and ſtanding on pretty long

footſtalks; theſe are a little indented on their edges, their ſurface rough, and a little hoary. The flowers, which are of a deep purple colour, come out in whorles round the ſtalks, ſetting very cloſe to the branches, at the footſtalks of the leaves; each of theſe are ſmall, tubuloſe, and monopetalous, cut into four obtuſe ſegments at the top, which expand and contain four filiform filaments, topped with oblong yellow antheræ. In the center is placed a roundiſh germen, which afterwards becomes a ſmooth, round, ſucculent berry, which turns firſt to a bright red colour, but afterwards changes to a deep purple when ripe, and incloſes four hard oblong compreſſed ſeeds. The leaves of this ſhrub is ſaid to be uſed in dropſical caſes, with very good ſucceſs.

CALLIGONUM, in botany, a genus of polyandrious plants, whoſe flower is apetalous, and conſiſts of a pentaphyllous calix, the leaves of which are concave, roundiſh, and premanent; the filaments are ſmall and numerous, topped with double antheræ; the fruit is an oval, compreſſed, ſtriated, hairy pericarpium, with bifid tops, turning backwards, containing a ſingle ſeed. In this genus Linnæus has claſſed the polygonoides of Tournefort.

CALLIMUS, καλλιμος, in natural hiſtory, the name uſed by the ancients for the looſe ſubſtance found within the ætites, or eagle-ſtone. See the article ÆTITES.

CALLING *the Houſe*, in the Britiſh parliament, is the calling over all the members names, every one anſwering to his own, and going out of the houſe, in the order in which he is called: this they do in order to diſcover whether there be any perſons there not returned by the clerk of the crown; or if any member be abſent without leave of the houſe.

CALLIPIC PERIOD, was an improvement of the cycle of Meton, of nineteen years, which Callipus, a famous Grecian aſtronomer, finding in reality to contain nineteen of Nabonaſſar's years, four days, and $\frac{3}{4}\frac{1}{5}\frac{1}{3}$, he, to avoid fractions, quadrupled the golden number, and by that means made a new cycle of ſeventy-ſix years; which time being expired, he ſuppoſed the lunations or changes of the moon would happen on the ſame day of the month, and hour of the day, that they were on ſeventy-ſix years before: but this has been demonſtrated to be falſe, erring a whole day in five hundred and fifty-three years.

CALLISTEA, in Grecian antiquity, a Leſbian feſtival, wherein the women preſented themſelves in Juno's temple, and the prize was aſſigned to the faireſt. There was another of theſe contentions at the feſtival of Ceres Eleuſinia, among the Parrhaſians, and another among the Eleans, where the moſt beautiful man was preſented with a complete ſuit of armour, which he conſecrated to Minerva, to whoſe temple he walked in proceſſion, being accompanied with his friends, who adorned him with ribbons, and crowned him with a garland of myrtle.

CALLOSUM CORPUS, in anatomy, a whitiſh hard ſubſtance, joining the two hemiſpheres of the brain, and appears in view when the two hemiſpheres are drawn back. See the article BRAIN.

In this part Lanciſi, and ſeveral others, have ſuppoſed the ſoul particularly to reſide.

CALLOUS, *Calloſus*, ſomething partaking of the nature of a callus.

CALLUS, or CALLOSITY, in a general ſenſe, any cutaneous, corneous, or oſſeous hardneſs, whether natural or preternatural: but moſt frequently it means the callus generated about the edges of a fracture, provided by nature to preſerve the fractured bones, or divided parts, in the ſituation in which they are replaced by the ſurgeon.

A callus, in this laſt ſenſe, is a ſort of jelly, or liquid viſcous matter, that ſweats out from the ſmall arteries and bony fibres of the divided parts, and fills up the chinks, or cavities, between them. It firſt appears of a cartilaginous ſubſtance, but at length becomes quite bony, and joins the fractured part ſo firmly together, that the limb will often make greater reſiſtance to any external violence with this part, than with thoſe which were never broken.

But as the new fleſh in wounds will often ſprout up too faſt, ſo will the callus in fractures, and by this means render the limb uneven and deformed: the only meaſure to prevent this luxuriancy, is by making the bandage ſomewhat tighter than ordinary, and wetting it firſt with ſpirits of wine. When the callus is indurated, we have no medicine that will deſtroy it, or take it down: however, the emplaſtrum de ranis vigon. cum mercurio, tying a plate of lead over it, is preſcribed for taking it down.

CALLUS is alſo a hard, denſe, inſenſible knob, riſing on the hands, feet, &c. by much friction and preſſure againſt hard bodies.

CALM, in the marine language, that ſtate of reſt which appears in the air and ſea when there is no wind ſtirring.

That tract of the Atlantic ocean, ſituated between the tropic of Cancer and the latitude of 29° north, or the ſpace between the trade and variable winds, is frequently ſubject to calms of very long continuance; and hence it has juſtly acquired the name of the calm-latitude.

A long calm is often more fatal to a ſhip than the ſevereſt ſtorm, if ſhe is tight, and in good condition; as the proviſions and water may be entirely conſumed, where there may be no opportunity to obtain a freſh ſupply: at ſuch a time the ſurface of the ocean is ſmooth and bright as a looking-glaſs.

CALOGERI, in church hiſtory, monks of the Greek church, divided into three degrees, the novices,

vices, called archari; the ordinary profeſſed, called microchemi; and the more perfect, called megalochemi: they are likewiſe divided into cænobites, anachorets, and recluſes. The cænobites are employed in reciting their office from midnight to ſunſet; they are obliged to make three genuflexions at the door of the choir; and returning, to bow to the right and to the left, to their brethren. The anachorets retire from the converſation of the world, and live in hermitages in the neighbourhood of the monaſteries; they cultivate a little ſpot of ground, and never go out but on Sundays and holidays, to perform their devotions at the next monaſtery. As for the recluſes, they ſhut themſelves up in grottos and caverns, on the tops of mountains, which they never go out of, abandoning themſelves entirely to providence: they live on the alms ſent them by the neigbouring monaſteries.

CALOMEL, in the materia medica, a name given to mercurius dulcis, ſublimated ſix times: the preparation is done thus.

Take corroſive ſublimate a pound, purified mercury nine ounces; add the quickſilver to the mercury, reduce to powder, and digeſt them together in a glaſs mattreſs, in a gentle ſand heat, frequently ſhaking the veſſel, till the whole is united: when they are thus mixed, increaſe the heat, ſo as to ſublimate the whole: take out the ſublimate, and ſcrape off an acrid part that is found at the top of it; and if any globules of mercury appear, ſeparate them alſo: let the ſublimation be repeated ſix times. It is a gentle purgative, and a very noble attenuant. It is the greateſt of all medicines againſt worms, and is now the general remedy in a gonorrhœa. The common method of giving it is in a bolus, over night, ten or twelve grains for a doſe, and a purging draught the next morning, &c. Rubbed with an equal quantity of ſulphur antimonii auratum, it is recommended as a powerful and ſafe alterative.

CALOPHYLLUM, a genus of polyandrious plants, whoſe flower conſiſts of four roundiſh, concave, patent petals; the filaments are numerous, ſhort, filiform, and topped with erect oblong antheræ; the fruit is a large globoſe drupe, containing a round ſub-acuminated nut. In this genus Linnæus has claſſed the calaba of Plumier.

CALOTTE, a cap or coif of hair, ſatin, or other ſtuff; an eccleſiaſtical ornament in moſt popiſh countries.

CALOTTE, in architecture, a round cavity or depreſſure, in form of a cap or cup, lathed and plaiſtered, uſed to diminiſh the riſe or elevation of a moderate chapel, cabinet, alcove, &c. which, without ſuch an expedient, would be too high for other pieces of the apartment.

CALQUING, or CALKING, a term uſed in painting, &c. where the backſide of any thing is covered with a black or red colour, and the ſtrokes or lines traced through, on a waxed plate, wall, or other matter, by paſſing lightly over each ſtroke of the deſign with a point, which leaves an impreſſion of the colour on the plate or wall.

CALTHA, marſh-marygold, in botany, a genus of polyandrious plants, the flower of which conſiſts of five large, oval, plane, deciduous petals; the filaments are ſlender and numerous, ſhorter than the petals, and topped with obtuſe erect antheræ; in the center is placed ſeveral oblong compreſſed germen, which afterward becomes ſo many ſhort, acuminated bicarinated capſules, containing a number of roundiſh ſeeds.

Marſh-marygolds grow upon moiſt boggy lands in many parts of England, a variety of which, with double flowers, is preſerved in ſome gardens, and is propagated by parting the roots in autumn.

CALTHA is alſo the name by which Tournefort calls the calendula, or marygold.

CALTROPS. See the article CHAUSSES-TRAPES, or CROWS-FEET.

CALTROPS, in botany. See the article TRIBULUS.

Water CALTROPS. See TRAPA.

CALVARIA, in anatomy, the hairy ſcalp or upper-part of the head, which, either by diſeaſe, or old age, grows bald firſt. See the articles HEAD and CALVITIES.

CALVARY, in heraldry, a croſs ſo called, becauſe it reſembles the croſs on which our Saviour ſuffered. It is always ſet upon ſteps.

CALVINISTS, in church hiſtory, thoſe who follow the opinions of John Calvin, one of the principal reformers of the church in the ſixteenth century, a perſon of great parts and induſtry, and of conſiderable learning; whoſe doctrine ſtill ſubſiſts in its greateſt purity at Geneva, where it was firſt broached, and from whence it was propagated. This is the prevailing religion of the United Provinces. In England it is confined among the diſſenters; and, in Scotland, it ſubſiſts in its utmoſt rigour.

The Calviniſts are great advocates for the abſoluteneſs of God's decrees; and hold that election and reprobation depend on the mere will of God, without any regard to the merit or demerit of mankind; that he affords to the elect an irreſiſtible grace, a faith that they cannot loſe, which takes away the freedom of will, and neceſſitates all their actions to virtue.

The Calviniſts believe that God fore-knew a determinate number, whom he pitched upon to be perſons, in whom he would manifeſt his glory; and that, having thus fore-known them, he predeſtinated them to be holy, in order to which he gives them an irreſiſtible grace, which makes it impoſſible for them to be otherwiſe.

CALVITIES, or CALVITIUM, in medicine, baldneſs,

baldneſs, or a want of hair, particularly on the ſinciput, occaſioned by the moiſture of the head, which ſhould feed it, being dried up, by ſome diſeaſe, old age, or the immoderate uſe of powder, &c. See the article ALOPECIA.

CALUMET, a ſymbol of peace among the Indians in the north of America. It is made of a red ſtone, like our marble; the head reſembles our tobacco-pipes, but larger; and is fixed on a hollow reed, to hold it for ſmoaking; they adorn it with fine wings of ſeveral colours, and is the calumet of the ſun, to whom they preſent it, eſpecially if they want fair weather, or rain. This pipe is a paſs and ſafe-conduct amongſt all the allies of the nation who has it given: in all embaſſies the ambaſſador carries it as an emblem of peace, and it always meets with a profound regard; for the ſavages are generally perſuaded, that a great misfortune would befal them, if they violated the public faith of the calumet.

CALX, properly ſignifies lime, but it is alſo uſed by chemiſts and phyſicians for a fine powder remaining after the calcination, or corroſion of metals and other mineral ſubſtances. See CALCINATION and LIME.

CALYCANTHUS, in botany, a genus of icoſandrious plants, whoſe flower is apetalous; but contain a monophyllous calx; the filaments are numerous, and awl-ſhaped, topped with oblong, ſulcated antheræ; the germina are numerous, and contains a number of caudated ſeeds. In this genus Linnæus has included the bureria, butneria, and baſteria of other authors.

CALYCISTÆ, an appellation given by Linnæus to thoſe botaniſts who have claſſed plants according to the different ſtructure of the calx, or cup of the flowers; ſuch was Magnolius.

CALYPTRA, or veil, a term given by botaniſts to a peculiar kind of calyx; it is a thin membranaceous involucrum, uſually of a conic figure, and covers the ſtamina, and other parts of fructification: the capſules of moſt of the moſſes have calyptræ.

CALYX, among botaniſts, ſignifies the cup of a flower; this is the termination of the cortex, or outer bark of plants, which, after accompanying the trunk or ſtem through all its branches, breaks out with the flower, and is preſent in the fructification; in this new form its chief uſe is to incloſe and protect the other parts. The calyx has received different appellations, according to the circumſtances with which it is attended, and on that account diſtinguiſhed by ſeveral names, as perianthium, involucrum, amentum, ſpatha, gluma, calyptra, and volva. See the articles PERIANTHIUM, &c.

That the calyx is a part of the flower, (though it often attends the fruit) is manifeſt from hence, that there is no inſtance of its coming out after the plant has done flowering. Calyx is alſo often ſtyled the empalement of a flower.

CAMÆA, in natural hiſtory, a genus of the ſemipellucid gems, approaching to the onyx ſtructure, being compoſed of zones, and formed on a cryſtalline baſis; but having their zones very broad and thick, and laid alternately on one another, with no common matter between; uſually leſs tranſparent, and more debaſed with earth than the onyxes.

CAMAIEU, or CAMEHUIA, in natural hiſtory, the ſame with camæa. See the preceding article.

CAMAIEU is alſo a term in painting, when there is only one colour, the lights and ſhades being of gold, or on a golden and azure ground. It is chiefly uſed to repreſent baſſo-relievos.

CAMALDULIANS, a religious order founded by St. Romauld, in a little plain on the Mount Apennine, called Camaldali, ſituated in the ſtate of Florence.

CAMBERED-DECK, in the marine, the deck, or flooring of a ſhip, is ſaid to be cambered, or to lie cambering, when it is higher in the middle of the ſhip, and droops towards the ſtem and ſtern, or the two ends; alſo when it lies irregular, being higher in one place than another, a circumſtance which renders the ſhip very unfit for war.

CAMBLET, or CAMLET, a plain ſtuff, compoſed of a warp or woof, which is manufactured on a loom, with two treddles, as linens are.

There are camblets of ſeveral ſorts, ſome of goats-hair, both in the warp and woof; others, in which the warp is of hair, and the woof half hair and half ſilk; others again, in which both the warp and the woof are of wool; and laſtly, ſome, of which the warp is of wool and the woof of thread. Some are dyed in the thread, others are dyed in the piece, others are marked or mixed; ſome are ſtriped, ſome waved or watered, and ſome figured.

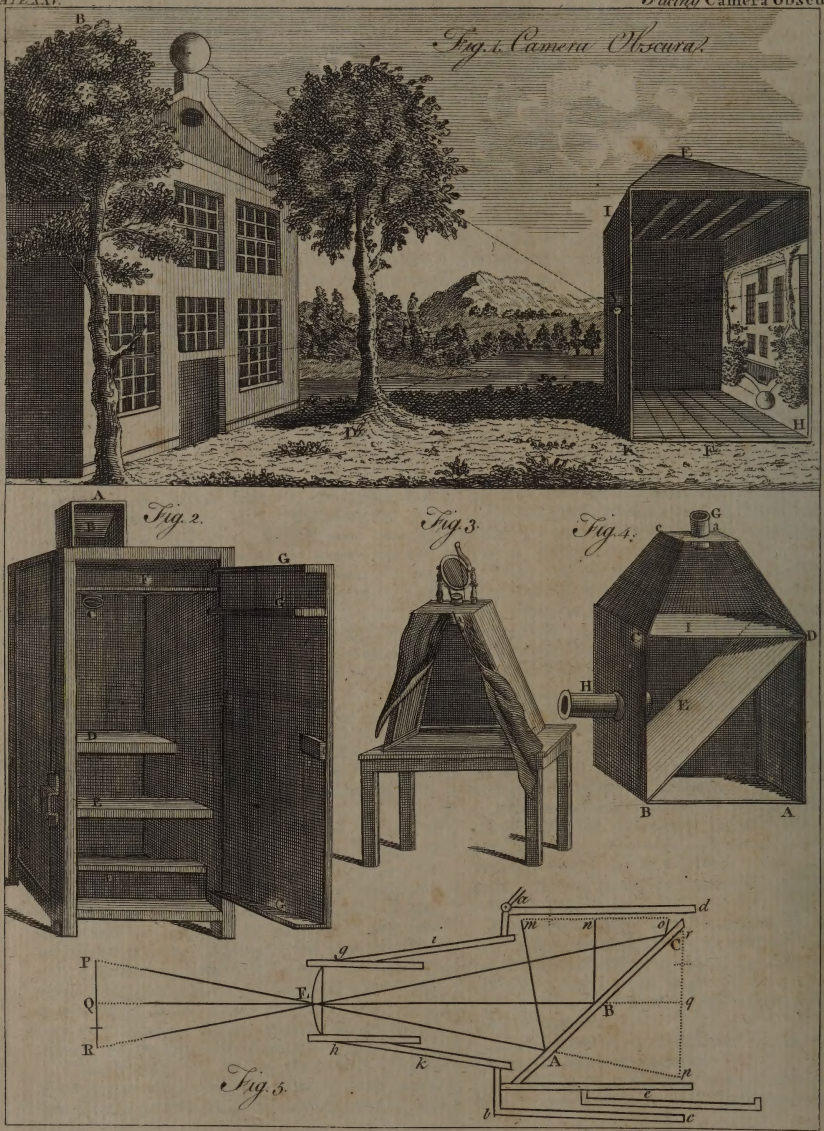
CAMEL, *Camelus*, in zoology, a genus of quadrupeds, of the order of the pecora; diſtinguiſhed from the reſt by having no horns.

This genus comprehends the camel, properly ſo called, with two bunches on its back; the dromedary, or camel with a ſingle bunch; the glama, or Peruvian camel, with a gibboſe breaſt and even back; and the pacos, or camel with no gibboſity at all.

The camel is larger than the dromedary, and covered with a fine fur, ſhorter as well as ſofter than that of the ox kind; only about the branches there grow hairs nearly a foot long. It is a native of Aſia, particularly of Bactria, and makes an excellent beaſt of burden.

CAMELEON, or CHAMELEON, in zoology. See the article CHAMÆLEON.

CAMELLIA, in botany, a genus of plants: the flower conſiſts of five ovated petals, connected vertically



J. Lodge sculp.

tically at the base; the fruit is a turbinated, lignose, and furrowed capsule; the seeds are numerous and small.

CAMELOPARDALIS, in zoology, a creature of the deer kind, otherwise called zurnapa. See the article ZURNAPA.

CAMELOPARDALIS, in astronomy, is a new constellation in the northern hemisphere, formed by Hevilius, consisting of thirty-two stars, first observed by him; but since his time many more have been observed, and their places settled. This constellation is situated between Cepheus, Cassiopeia, Perseus, the two Bears, and Draco. The right ascension, declination, with the variation, &c. to the year 1770, is exhibited in the following catalogue.

Order.	Magn.	Name.	Bayer Let.	Right Ascension	Distance from Nor. Pole.	Var. in Right Ascen.	Var. in Declination.
				° ′ ″	° ′ ″	′	′
1	6			63.17. 3	36.37.56	69.2	9.1
2	5			65.16.12	37. 1. 3	69.2	8.4
3	6			65.16.24	37.24.44	69.4	8.4
4	6			67. 3.54	33.40.51	73.4	7.8
5	6			68.54.53	35. 9.28	72.0	7.2
6	6			69.18.10	34.34.44	73.0	7.1
7	5			69.32.34	36.39.16	70.1	7.0
8	7			70.11.13	37.13.38	70.3	6.9
9	4.5			70.18.32	24.12.24	73.0	6.0
10	4.5			70.29.58	29.55.54	75.1	6.7
11	5			71.20.47	31.23.15	74.2	6.4
12	6			71.21. 2	31.20.16	71.2	6.4
13	4.5			72. 0.52	37.52. 2	73.4	6.2
14	5			72.48.39	27.37.42	78.0	6.0
15	6			74.41.32	32. 9.32	72.0	5.2
16	6			75.44.20	32.42.22	71.3	4.9
17	6			76.49.12	27. 9.42	72.1	4.6
18	6			77.59.58	32.57.54	71.5	4.2
19	6			78.32.18	26. 1. 5	81.0	4.0
20	7			79.16.57	33.40.10	71.4	3.7
21	6.7			79.34.34	28.13.46	78.5	3.6
22	7.8			79.41.59	33.47.50	71.8	3.5
23	6			80.22.15	28.46.30	78.1	3.3
24	6			80.40.19	33.33.56	71.9	3.2
25	7.8			81. 2.23	35.16.28	70.4	3.1
26	5.6			81.34.43	34. 0.24	71.0	2.9
27	5.6			81.55.44	33. 2.12	74.0	2.9
28	6.7			81.38 33	33.11.52	72.0	2.9
29	5.6			82.31.40	33.11. 4	72.8	2.6
30	6			82.46.54	31. 7.38	73.0	2.5
31	5			83.22.20	30.11.27	74.0	2.3
32	5			83.44.13	34.22. 5	79.0	2.2
33	7			84.22.50	34.24.10	71.6	2.0
34	6			84.56. 4	34.41. 8	71.5	1.8
35	5.6			86.25.42	38.25.35	71.6	1.4
36	6			87.10. 0	24.15.56	86.2	1.0
37	5.6			87.12.36	31. 3.38	73.6	1.0
38	7			87.26.23	30.49. 9	73.8	0.8

Order.	Magn.	Name.	Bayer Let.	Right Ascension	Distance from Nor. Pole.	Var. in Right Ascen.	Var. in Declination.
				° ′ ″	° ′ ″	′	′
39	6.7			87.26.34	29.31.50	74.0	0.7
40	6.7			88.30.46	29.57.29	75.0	0.6
41	7			94.34.36	27.53.13	80.2	1.6
42	4.5			96.31.30	22.11.53	91.0	2.3
43	4.5			97. 0.57	20.52.16	94.2	2.4
44	6			104.24.14	30.40.36	73.8	5.0
45	7			104.31.27	30.27.58	74.0	5.0
46	7			104.41.52	30.20.13	74.2	5.1
47	6			105.16. 7	29.40.27	75.0	5.2
48	6			109.46.55	29.54.45	73.4	6.8
49	5			111.12.22	26.36.46	80.4	7.3
50	6			111.25.45	39. 1.55	69.1	7.4
51	5			111.52.33	23.59.52	85.0	7.5
52	5			113.14.53	32.52.57	71.7	8.2
53	6			114.18.18	29. 2.39	76.0	8.6
54	6			115.45. 8	34. 4.44	73.4	8.7
55	5			116. 4.14	20.52.30	72.1	9.4
56	6			118.58. 0	28.54.57	75.4	9.7
57	5			119.19.46	26.46.22	78.2	9.8
58	5			119.20.22	26.51.40	78.2	10.0

CAMERA OBSCURA, in optics, a machine, representing an artificial eye, wherein the images of objects are exhibited distinctly, and in their native colours, either invertedly, or erect.

The camera obscura, or dark chamber, is of two kinds. The one is no other than a convex lens fixed in a hole of a window-shutter, which lens, when no other light is permitted to enter the room, except what passes through it, will represent all the external objects, that are visible through that hole, upon a white paper held at the focal distance of the lens, painted in their proper colours; but the objects will be represented inverted, because the pencil of rays that flows from the object crosses in the middle of the glass. The other sort of camera obscura, is that which is called the portable one, and is of use in drawing landscapes, &c.

In Plate XXV. you have represented the different sorts of cameras.

Fig. 1. is of the first kind above-mentioned, where A B C D is the prospect of a house, trees, &c. E F a darkened room, or camera obscura, on one side is the picture G H of the above view inverted, formed by a convex lens, fixed in a large cylindric pole, bored through the middle of a ball, commonly called the sky-optic-ball, which is easily moveable about its centre, within a hollow zone made of wood, and fastened to the window-shutter at V; this zone consists of two half zones screwed together in the middle after the ball was let in, and the concavity of the zone hinders the light from passing between it and the ball.

Fig. 2. is a portable camera obscura in the form

the Grecian camps, it may be obſerved, that the moſt valiant of the ſoldiers were placed at the extremities, the reſt in the middle. Thus we learn from Homer, that Achilles and Ajax were poſted at the ends of the camp before Troy, as bulwarks on each ſide of the princes.

The camps of the Romans were generally either of an exact ſquare form, or elſe oblong; though this was often accommodated to the ſituation of the place. They were always fortified, and a very exact diſcipline maintained in them, in order to prevent ſurprizes from the enemy.

CAMP is alſo uſed by the Siameſe, and ſome other nations in the Eaſt-Indies, as the name of the quarters which they aſſign to the foreigners who come to trade with them.

In theſe camps every nation forms, as it were, a particular town, where they carry on all their trade, not only keeping their warehouſes and ſhops there, but alſo live in theſe camps with their whole families. The Europeans, however, are ſo far indulged, that at Siam, and almoſt every where elſe, they may live either in the cities or ſuburbs, as they ſhall judge moſt convenient.

Flying CAMP, the ground on which a flying army is encamped.

CAMP-DISEASES are chiefly a bilious fever, malignant fever, ſcurvy, fluxes, &c. See the articles FEVER and CAMPAIGN.

CAMP-HOSPITAL. See HOSPITAL.

CAMPAIGN, in the art of war, denotes the ſpace of time that an army keeps the field, or is encamped, in oppoſition to quarters.

CAMPANIFORM, or CAMPANULATED, an appellation given to flowers reſembling a bell; a characteriſtic, whereon Tournefort eſtabliſhes one of his claſſes. See the article BOTANY.

The word is compounded of the Latin, *campana*, a bell, and *forma*, reſemblance.

CAMPANULA, bell-flower, in botany, a genus of plants, the flower of which conſiſts of a campanulated ſingle petal; the baſe broad and impervious; the limb lightly divided into five broad, acute, petalous ſegments. The nectarium is ſituated in the bottom of the carolla, and is formed of five acute connivent valves. The fruit is an angulated roundiſh capſule, with three or five cells, and having ſo many foramina in the ſides, for letting out the ſeeds. The ſeeds are numerous and ſmall, and the receptacle fixed and columnar.

CAMPEACHY-WOOD, *Campecia*, in botany, the ſame with the hæmatoxylum of Linnæus, otherwiſe called logwood.

It is brought to us in large and thick blocks or logs, and is the heart only of the tree which produces it. It is very heavy, and remarkably hard. It is not eaſily cut, but it ſplits pretty readily in a longitudinal direction.

Campeachy-wood muſt be choſen in large and thick pieces, ſound, and of a deep red colour. It has been long known among the dyers; but it is only of late that it has been introduced into medicine. It is found to be an excellent aſtringent, and is given, in form of an extract, in diarrhœas, with very great ſucceſs.

CAMPHOR, in the materia medica, a body of a particular nature, being a mixed ſubſtance, dry, white, tranſparent and brittle, and of a very penetrating ſmell.

There are ſundry Indian plants from which camphors are obtainable, but only two which afford any large quantity, and from which this commodity is commonly prepared, one growing in Sumatra and Borneo, the other in Japan, as particularly about Satſuma. The firſt is called by Breynius *camphorifera Sumatrana*, &c. the camphor-tree of Sumatra, with leaves like thoſe of the clove-tree, but longer pointed, a large oblong fruit, and a very large cup, ſomewhat reſembling a tulip: the latter, *camphorifera Japonica*, &c. the camphor-tree of Japan, with bay-like leaves, a ſmall globular fruit, and a very ſhort cup. The camphor of the Japan ſpecies is the only ſort kept in the ſhops, the other being never brought into Europe. This tree is about the ſize of a large lime, the flowers are white, the fruit is a ſmall red berry. All the parts of it are impregnated with camphor, but the roots contain moſt: hence the roots are chiefly made uſe of for the preparation of this commodity; though, in want of ſufficient quantities of theſe, the wood and leaves are mixed.

The camphor is extracted by diſtillation with water in large iron pots, on which are fixed earthen heads ſtuffed with ſtraw; greateſt part of the camphor concretes among the ſtraw in its cryſtalline form, and a part likewiſe paſſes down into the receiver along with the water. It is ſaid by ſome to be extracted by ſublimation without water; but by ſuch a proceſs, it could not avoid receiving from the woody matter an empyreumatic ſmell, which it is never found to have. The rough camphor, as firſt diſtilled, looks much like the grey, ſmall-cryſtalled Eaſt-Indian ſalt-petre, or like common bay-ſalt: in this ſtate it is imported in caniſters into Europe, particularly into Holland, and there purified or refined.

The refining of camphor was formerly one of the manufactures of Venice, the Venetians being then the only people in Europe who traded directly to the Eaſt-Indies: but that trade has long ago paſſed into other hands; the Venetians now import little or no camphor, and the art of refining it is known only to the Dutch. The Engliſh and French import ſome rough camphor, but ſend it to Amſterdam to be refined, having never been able to ſucceed in the proceſs themſelves.

Camphor, conſidered as a medicine, is a very warm diaphoretic and antiſeptic: it does not however

ever heat the conſtitution ſo much as might be expected from its hot pungent taſte. I have been aſſured by an eminent phyſician, that a ſingle drop of oil of cinnamon, though generally containing a little expreſſed oil, heats more than ten grains of camphor, and an ounce of ſtrong ſpirit of wine more than a whole dram. Camphor is employed likewiſe in fire-works, and in ſundry other arts, particularly for varniſhes. Camphorated varniſhes excellently preſerve both animal and vegetable bodies, and peculiarly reſiſt worms and other inſects. Camphor, in ſubſtance, alſo laid among clothes, preſerves them from moths.

CAMPION, in botany, a name ſometimes given to the lychnis. See the article LYCHNIS.

Viſcous CAMPION. See SILENE.

CAMPUS, in antiquity, a ſpace of ground in cities, left without any buildings, not unlike what we call fields or ſquares.

CAMPUS MAII, in ancient cuſtoms, an anniverſary aſſembly of our anceſtors held on May-day, when they confederated together for defence of the kingdom againſt all its enemies.

CAMPUS MARTIUS, among the Romans, a field by the ſide of the Tyber, where the youth exerciſed themſelves in warlike exerciſes. It was ſo called on account of a temple that ſtood on it, conſecrated to the god Mars.

CANAL, *Canalis*, in hydrography, a kind of artificial river, made for the convenience of water-carriage.

CANALS are contrived for various purpoſes, ſome for forming a communication between one place and another; as the canals between Bruges and Ghent, or between Bruſſels and Antwerp; others for the ornament of a garden, or houſe of pleaſure, as thoſe of Verſailles, Fontainbleau, or St. James's Park.

Egypt is full of canals, dug to receive and diſtribute the waters of the Nile at the time of its inundation: theſe however are dry the reſt of the year, except the canal of Joſeph, and four or five others, which may be ranked as conſiderable rivers.

CANALS of communication are artificial cuts, commonly furniſhed with locks and ſluices, and ſuſtained by banks or mounds, in order to make a quicker paſſage, and ſhorten the way between one place and another, by means of veſſels.

Store of navigable canals and rivers is one of the marks of good policy in a country; in which reſpect Italy, the Netherlands, and France, but eſpecially China, abound as much as England is defective.

In China indeed there is ſcarcely a town or village but what has the advantage of an arm of the ſea, a navigable river, or a canal, by which means navigation is rendered ſo common, that there are almoſt as many people on the water as land: but in England we have only one remarkable canal, and that made by other people, and ſuffered to decay by ourſelves; that is, the ancient canal from the river Nen, a little below Peterborough, to the river Witham, three miles below Lincoln, called by the modern inhabitants *Caerdike*; which may be ranked amongſt the monuments of the Roman grandeur, though almoſt filled up now. It was forty miles long; and, ſo far as appears from the ruins, muſt have been very broad and deep. Some authors take it for a Daniſh work. Morton will have it made under the emperor Domitian: urns and medals have been diſcovered on the banks of this canal, which ſeem to confirm that opinion.

The canal of Languedoc, called alſo the *canal of the two ſeas*, as ſerving to join the Mediterranean and Cantabrian ſeas, was firſt propoſed under Francis I. but begun and finiſhed under Louis XIV. By means of it a ready communication is made between the two fertile provinces of Guyenne and Languedoc: the canal is ſixty-four leagues long, extended from Narbonne to Tholouſe, and, receiving ſeveral little rivers in the way, ſupported at proper intervals with one hundred and four ſluices. In ſome places it is conveyed over aqueducts and bridges of incredible height, built on purpoſe, which give paſſage underneath to conſiderable rivers. What is moſt extraordinary is, that in ſome places, for a mile together, a paſſage is dug out for it through the rock. The expence was thirteen millions of livres, of which the king contributed ſeven, and the province of Languedoc the reſt.

The canals of Briere and Orleans are alſo of very great uſe for the ſame purpoſes.

The canal of Egypt, for a communication between the Nile and the Red Sea, was begun, according to Herodotus, by Necus, ſon of Pſammeticus, who deſiſted from the attempt, on an anſwer from the oracle, after having loſt ſix-ſcore thouſand men in the enterprize. It was reſumed and compleated by Darius, ſon of Hyſtaſpes, or, according to Diodorus and Strabo, by Ptolemy Philadelphus; who relate, that Darius relinquiſhed the work, on a repreſentation made to him by unſkilful engineers, that the Red Sea, being higher than the land of Egypt, would overwhelm and drown the whole country. It was wide enough for two galleys to ſail abreaſt; its length was four days ſailing. It ſeems to have been opened anew by the caliph Omar, in the year 635. Elmacin indeed ſays, that a new canal was then made for the conveyance of the corn of Egypt to Arabia; but this is more naturally underſtood of a removal of the ancient one; the navigation of which, towards the decline of the Roman empire, had been much neglected: there are ſome traces of it however ſtill ſubſiſting.

The great canal of China is one of the wonders of art, made about eight hundred years ago. It runs from north to ſouth quite croſs the empire, beginning at the city Canton. By it all kinds of foreign merchandize, entered at that city, are carried directly to Pekin, a diſtance of eight hundred and

twenty-five miles. Its breadth and depth are sufficient to carry barks of considerable burden, which are managed by sails and masts, as well as towed by hand. On this canal the emperor is said to employ ten thousand ships, abating one for a reason very particular. It passes through, or by, forty-one large cities; there are in it seventy-five vast locks and sluices to keep up the water, and pass the barks and ships, where the ground will not admit of a sufficient depth of channel, besides several thousand draw, and other bridges on it.

The Spaniards have several times had in view the digging a canal through the isthmus of Darien, from Panama to Nombre de Dios, to make a ready communication between the Atlantic and the South-sea, and thus afford a straight passage to China and the East-Indies.

CANAL of an aqueduct, is the part through which the water passes; which, in the ancient edifices of this kind, is lined with a coat of mastic of a peculiar composition.

CANAL, in anatomy, a duct or passage through which any of the juices flow: as, 1. The semi-circular canals, distinguished by the epithets of the largest, the middle one, and the least, in the labyrinth of the ear, opening by five orifices into the vestibule. 2. The canals of the auditory nerve, viz. the common and larger, in which there are little apertures into the labyrinth, and the proper, narrower, and longer, terminating partly by a little aperture in the cavity of the cranium, and partly in the aqueduct of Fallopius. 3. The canalis arteriosus, between the pulmonary artery and the aorta of a fœtus, which serves for a peculiar circulation in the fœtus. 4. The nasal canal. 5. The canalis semilunaris. And 6. The canalis venosus. See the article FOETUS, NOSE, &c.

CANAL *of the Larmier*, the hollowed platfond, or soffito of a cornice, which makes the pendent mouchette. See the articles of LARMIER and SOFFITO.

CANAL *of the Voluta*, in the Ionic capital, the face of the circumvolutions inclosed by a listel.

CANALICULATE, or CANALICULATED, something hollowed in the manner of a canal; thus we say a canaliculated leaf, a canaliculated stalk.

CANARY-BIRD, *Passer Canariensis*, the English name of the whitish fringilla, with the wings and tail greenish.

Canary birds are natives of the Canary Islands, whence they have got their name; but the melody of their voice is so sweet, that there are few nations in Europe which do not keep them in cages, where they very readily breed.

CANARY-GRASS. See the article GRASS.

CAN-BUOY. See the artle BUOY.

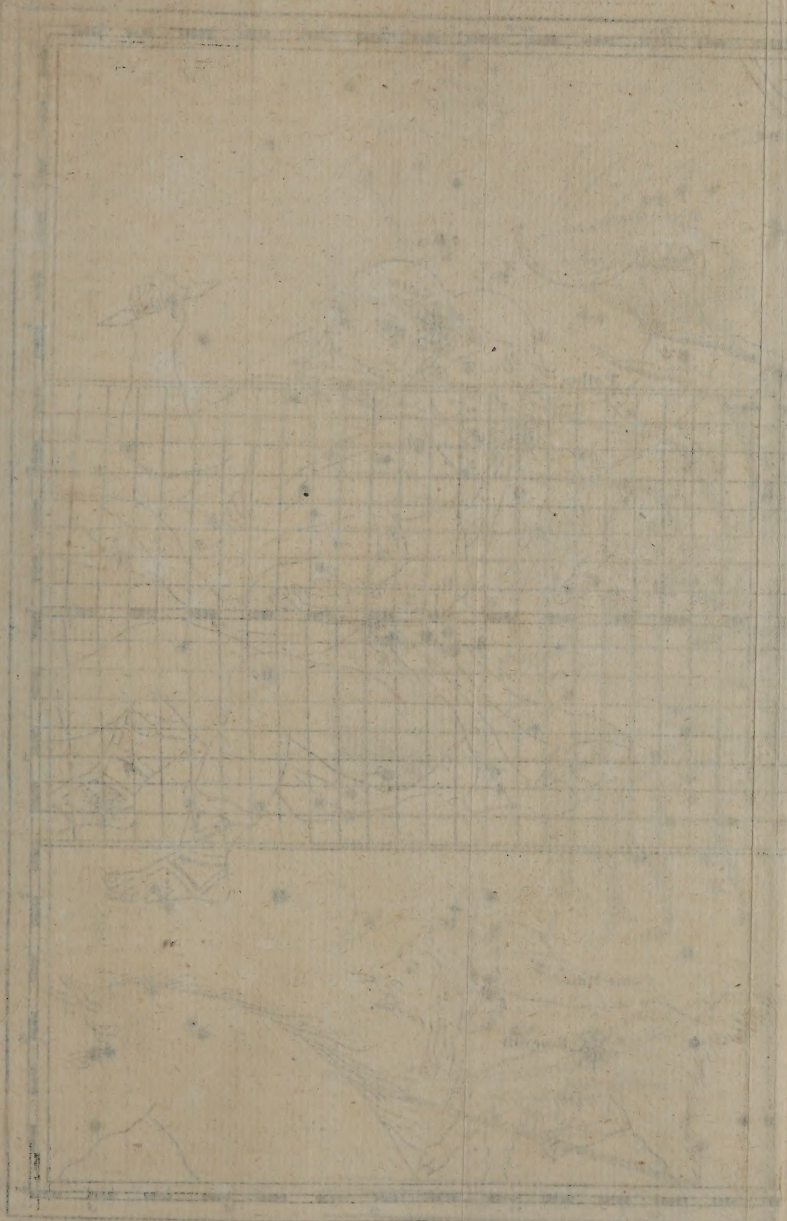
CANCER, the crab, in zoology, the name of a well-known shell-fish, of which there are a great many species; as the common large crab, the spider-crab, the Molucca-crab, or king-crab, the little woolly-crab, the prickly long-armed crab, &c.

CANCER, in surgery, a roundish unequal hard livid tumour, generally seated in the glandulous parts of the body, and at length appearing with turgid veins, shooting out from it so as to resemble, as it is thought, the figure of the crab-fish, or, as others say, because, like that fish, when once it has got hold, it is scarce possible to drive it away.

Cancerous, or scirrhous tumours, often appear spontaneously without any evident cause, and seem peculiar to certain constitutions; at others, they may be accidental, or proceed from sharp corrosive, or other coagulated juices in the body, errors in the non-naturals, a stoppage of the necessary evacuations, contusions, stagnation, or coagulation of the milk in the breast, &c. The immediate cause of a cancer seems to be a too corrosive volatile salt, approaching to the nature of arsenic, formed by the stagnation of humours, &c. Stolterforth observes, that it has been frequently cured by mercury and salivation. Some take an ulcerous cancer to be nothing else but an infinite number of little worms, which devour the flesh by degrees. The cancer is allowed to be the most terrible evil that befalls the body; it is usually cured, while yet a small tumour of the bigness of a nut, or at most a small egg, by extirpation; when it seizes the breast, or is burst into an ulcer, amputation takes place. It begins without any pain, and appears at first like a chicory pea, but grows apace, and becomes very painful. The cancer arises principally on the lax and glandulous parts, as the breasts and emunctories: it is most frequent in women, especially such, says Stolterforth, as are barren, or live in celibacy. The reason of its appearing in the breasts, more than other parts, is, they being full of glands, with lymphatics and blood-vessels among them, the smallest contusion, compression, or punction, extravasates those liquors, which grow by degrees acrimonious from the cancer. Hence the masters of the art say, that a cancer is that in the glands, which a caries is in the bones, and a gangrene in the fleshy part.

The cancer is, however, found in other soft spongy parts of the body; and there have been some found in the gums, belly, neck of the matrix, ureters, lips, nose, cheeks, abdomen, thighs, and even in the shoulders, as Stolterforth proves. A cancer arising on the leg is called a lupus; or in the face or nose, a noli me tangere. Cancers are divided, according to their several stages, into occult and open, or ulcerated: occult cancers are those not arrived at their state, or not yet burst; ulcerated cancers are known by their roughness and fulness of holes, through which oozes a filthy stinking glutinous matter, frequently yellowish; by their pungent pain, which resembles the pricking of pins; by their blackness, the swelling of the lips of the

ulcer,



CANCER.

J. Lodge Sculp.

ulcer, and the veins about it, which are blackiſh, tumid, and varicoſe: ſometimes the extremities of the blood-veſſels are gnawed off, and the blood iſſues out. In a cancer of the breaſt, the adjacent fleſh is ſometimes ſo conſumed, that one may ſee into the cavity of the thorax; it occaſions a ſlow fever, a loathing, oftentimes faintings, ſometimes a dropſy, and, laſtly, death.

Some cancerous tumours are moveable, others fixed; ſome inflamed, others paliſh, and attended with pain, heat, tenſion, and pulſation. In their beginning they are ſometimes no bigger than a pea, but often increaſe gradually to the ſize of a walnut, egg, &c. ſometimes alſo their growth is ſudden, and at others ſlow, ſo as to continue upon the increaſe many years together. When they ulcerate, the ſuppuration is generally partial, the matter they diſcharge ſeeming of an ill colour, and very fœtid.

All cancers are dangerous, and ſeldom give way to the uſe of evacuating medicines, eſpecially when they lie deep, or ſeem owing to a particular conſtitution of the patient. They alſo prove more difficult to cure, according to their ſize, the nature and office of the part they affect, the age of the patient, &c. Some occult cancers, particularly thoſe which happen in the breaſts of women, may remain harmleſs to the body for ſeveral years, and without ulcerating; though, upon any external injury, they may afterwards increaſe, break, and ſoon prove mortal. In this caſe, every thing that ſuddenly raiſes the velocity of the blood ſhould be carefully avoided.

The learned Dr. Stork, of Vienna, has publiſhed two pieces on the virtues of cicuta, or hemlock, in the cure of cancers, and given many remarkable caſes in which it was attended with ſucceſs. Experiments of the ſame kind have alſo been made in England, ſome of which have ſucceeded, while others have totally failed of ſucceſs: ſo that the virtues of the hemlock in curing this terrible diſeaſe are not yet properly eſtabliſhed. See the article CICUTA.

CANCER, in aſtronomy, is one of the twelve ſigns of the zodiac, repreſented on the globe, in the form of a crab, as in Plate XXVI. It is the fourth ſign, reckoning from the point Aries, and gives name to one of the quadrants of the ecliptic. According to Ptolemy it contains thirteen ſtars, Tycho Brahe fifteen, Bayer and Hevilius twenty-nine, but in the Britiſh Catalogue eighty-three.

The poets tell us, that this is the crab which bit Hercules by the heel while he was fighting with the ſerpent Hydra in the fen Lerna; for which ſervice the crab was placed in heaven by Juno, who was the utter enemy of Hercules. It was not without a great deal of propriety, that the ancients repreſented this ſign by the crab; for they firſt took notice that the ſun gradually aſcended above the equinoctial, till it arrived at this ſign, from which it afterwards declined again, and deſcended as gradually, which retrograde motion they very pertinently repreſented by the ſide-long, or retrograde motion of a crab. For the places of the ſtars in this conſtellation, ſee the following catalogue.

Order.	Magn.	Name.	Bayer Let.	Right Aſcenſion	Diſtance from Nor. Pole.	Var. in Right Aſcen	Var. in Declination.
				° ′ ″	° ′ ″	′	′
1	6			115.48.57	73.35.30	51.5	8.7
2	6	1ma ad	ω	116.35.39	63.57.58	52.7	8.9
3	6			116 44.37	71. 3. 8	49.3	8.9
4	6	2da ad	ω	116.48. 6	64.16.16	52.4	9.0
5	6			116.57. 8	72.53.53	49.5	9.1
6	5	Π norum	χ	117.10.58	61.33. 5	53.5	9.2
7	8			117.25.41	67.17.32	51.5	9.3
8	6			117.56. 3	76.12.57	48.5	9.4
9	7	1ma ad	μ	118. 2. 9	66.42. 5	53.8	9.4
10	5	2da ad	μ	118.24.15	67.44.16	53.4	9.5
11	6			118.31.43	61.50. 8	53.3	9.6
12	6			118.47.42	75.40.55	48.5	9.6
13	6.7	1ma ad	ψ	118.55.25	63.27.56	53.0	9.7
14	4	2da ad	ψ	119. 0. 5	63.46.22	54.5	9.8
15	5	3tia ad	ψ	119.33.50	59.28.46	54.0	9.8
16	5.6		ζ	119.36.24	71.38.39	51.9	9.9
17	4.3		β	120.53.22	80. 5.18	49.1	10.4
18	6		χ	121.21.47	62. 0.53	53.0	10.7
19	6		λ	121.34.19	65.13.30	53.0	10.9
20	6	1ma ad	d	122.24.47	70.55.10	52.0	10.9
21	6			122.38.29	78.37.45	48.0	11.0
22	6.7	1ma ad	φ	122.58. 6	61.19.51	53.2	11.0
23	6	2da ad	φ	123. 4. 2	62.18. 7	53.0	11.1
24	6	1ma ad	υ	123. 6.28	64.31.30	52 0	11.1
25	6	2da ad	d	123. 4.20	72.10.21	49.2	11.2
26	6	3tia ad	φ	123.14.20	61.21.16	53.0	11.2
27	6			123.22. 3	76.34.52	48.0	11.3
28	6.7	2da ad	υ	123.35.46	65. 4.50	51.7	11.3
29	6.7			123.48.21	75. 1.29	48.5	11.4
30	6	3tia ad	υ	124.19.48	65. 7.47	51.7	11.5
31	6.5		b	124.29.43	71. 6.31	51.8	11.5
32	7.8	4ta ad	υ	124.42.21	65. 6.57	51.5	11.8
33	6.7		y	124.43.43	68.45.33	52.6	11.9
34	6			124.53.26	79. 8.43	47.2	11.9
35	7			125.22.43	69.35.56	50.0	12.0
36	6	1ma ad	ε	126. 1.35	79.32. 6	47.0	12.1
37	6	2da ad	ε	126.17. 4	79.36.43	47.0	12.2
38	8	Nebul.	o	126.28.57	69.23.46	50.0	12.3
39	6	Præſep.		126.34.43	69.11.44	50.0	12.4
40	6	dictæ		126.35.58	69. 2. 4	50.0	12.4
41	7		ε	126.41. 6	69 38.50	50.0	12.4
42	7.8		ε	126.43.55	69.26.52	50.0	12.5
43	4	Aſellur.	γ	127.20.53	67.40.56	52.7	12.5
44	6	Bor.		127.22.28	71. 0.16	49.5	12.5
45	6	1ma ad	α	127.30.10	76.29. 6	49.5	12.5
46	6			127.39.11	58.26.57	53.7	12.6
47	4	Aſellus	δ	127.46.22	70.58.29	51.5	12 6
48	5	Auſt.	ι	128. 2.11	60.22.40	53.0	12.8

Order.	Magn.	Name.	Bayer Let.	Right Aſcenſion	Diſtance from Nor. Pole.	Var. in Right Aſcen.	Var. in Decli-nation.
				° ′ ″	° ′ ″	′	′
49	6		*b*	128.55.30	79. 4.26	47.2	13.0
50	6	2da ad	α	129.27.18	76. 2.11	49.6	13.3
51	6	1ma ad	σ	129.25.37	56.38.34	54.2	13.3
52	6			129.24.57	73. 7. 2	49.0	13.3
53	6	1ma ad	ϱ	129.28.52	60.51.25	52.5	13.3
54	7			129.29.34	73.47.21	49.0	13.3
55	6	2da ad	ϱ	129.34.43	60.45.48	52.7	13.3
56	6	3tia ad	ϱ	129.51.52	60.47. 1	52.7	13.3
57	5.6	2da ad	ι	129.53.23	88.49.32	53.5	13.3
58	6	4ta ad	ϱ	130.19.42	61.10. 6	52.5	13.3
59	5.6	2da ad	σ	130.35. 7	56.10.50	54.2	13.3
60	4.5	1ma ad	α	130.41.58	77.28.10	47.5	13.3
61	6			130.50. 4	58.51.35	53.2	13.3
62	6	1ma ad	ο	130.57.26	73.47. 3	48.5	13.3
63	6	2da ad	ο	131. 2.50	73.31.20	48.5	13.3
64	6	3tia ad	σ	131.11.13	56.39.44	54.0	13.4
65	4	2da ad	α	131.20. 0	77.13.55	47.5	13.4
66	6	4ta ad	σ	131.39.47	56.49.31	54.0	13.4
67	6.7	5ta ad	ϱ	131.52.32	61. 9.39	52.2	13.4
68	6			132. 5.13	71.58.59	49.0	13.4
69	6		ν	132. 9.31	64.37. 4	51.0	13.4
70	6.7	6ta ad	ϱ	132.27.27	61. 9.40	52.2	13.4
71	7			132.55.38	71.39.32	49.6	13.4
72	6.7		τ	133.23.25	59.23.36	52.7	13.4
73	6			133.26.33	73.45.37	48.2	13.4
74	6			133.31.22	74.30.44	48.0	13.4
75	6.7			133.40.11	62.23.50	51.7	13.4
76	4.5		κ	133.41.54	78.22.48	49.1	13.4
77	5 6		ξ	133.53.56	66.59.53	52.3	13.9
78	6			133.56.57	71.33.51	49.0	13.9
79	8			134. 9.47	69. 2.42	50.0	13.9
80	7			134.37.50	70.59. 1	49.0	14.0
81	7		π	134.49.10	73. 3. 8	50.2	14.1
82	6			135.30.20	74. 4.39	48.0	14.3
83	6			136.23.27	71.17.20	49.0	14.3

CANCEROUS, ſomething belonging to, or partaking of, the nature of a cancer. See the article CANCER.

CANDIDATE, a perſon who aſpires to ſome public office.

CANDLE, a ſmall taper of tallow, wax, or ſperma ceti; the wick of which is commonly of ſeveral threads of cotton, ſpun and twiſted together.

There are two ſorts of tallow-candles; the one dipped, the other moulded: the former are the common candles; the latter are the invention of the Sieur le Brege, at Paris.

The method of making candles, in general, is this: after the tallow has been weighed, and mixed in the due proportions, it is cut into very ſmall pieces, that it may melt the ſooner; for the tallow in lumps, as it comes from the butchers, would be in danger of burning or turning black, if it were left too long over the fire. Being perfectly melted and ſkimmed, they pour a certain quantity of water into it, proportionable to the quantity of tallow. This ſerves to precipitate to the bottom of the veſſel the impurities of the tallow which may have eſcaped the ſkimmer. No water, however, muſt be thrown into the tallow deſigned for the three firſt dippings; becauſe the wick, being ſtill quite dry, would imbibe the water, which makes the candles crackle in burning, and renders them of bad uſe. The tallow, thus melted, is poured into a tub, through a coarſe ſieve of horſe-hair, to purify it ſtill more, and may be uſed after having ſtood three hours. It will continue fit for uſe twenty-four hours in ſummer, and fifteen in winter.

The wicks are made of ſpun cotton, which the tallow-chandlers buy in ſkains, and which they wind up into bottoms or clues: whence they are cut out with an inſtrument contrived, on purpoſe, into pieces of the length of the candle required; then put on the ſticks or broches, or elſe placed in the moulds, as the candles are intended to be either dipped or moulded. Wax-candles are made of a cotton or flaxen wick, ſlightly twiſted, and covered with white or yellow wax. Of theſe there are ſeveral kinds; ſome of a conical figure, uſed to illuminate churches, and in proceſſions, funeral ceremonies, &c.

For the method of making wax-candles, ſee the article WAX-CHANDLER.

Sale or Auction by Inch of CANDLE, is when a ſmall piece of candle being lighted, the by-ſtanders are allowed to bid for the merchandize that is ſelling; but the moment the candle is out, the commodity is adjudged to the laſt bidder.

There is alſo an excommunication by inch of candle, when the ſinner is allowed to come to repentance, while a lighted candle continues burning; but after it is conſumed, he remains excommunicated to all intents and purpoſes.

CANDLE-BERRY MYRTLE, in botany. See the article MYRICA.

CANDLEMAS, a feaſt of the church held on the ſecond day of February, in honour of the purification of the Virgin Mary. It was borrowed from the practice of the ancient Chriſtians, who on that day uſed abundance of lights both in their churches and proceſſions, in memory, as is ſuppoſed, of our Saviour's being on that day declared by Simon, "To be a light to lighten the Gen-"tiles."

In imitation of this cuſtom, the Roman catholics, on this day, conſecrate all the tapers and candles which they uſe in their churches during the whole year.

CANDY, or *Sugar*-CANDY, a preparation of ſugar, made by melting and cryſtallizing it ſix or ſeven times over, to render it hard and tranſparent.

It

It is of three kinds, white, yellow, and red. The white comes from the loaf-ſugar, the yellow from the caſſonado, and the red from the muſcovado. See SUGAR.

Sugar-candy is moſt proper in colds, becauſe it melts ſlowly, and thereby gives time to the ſaliva to mix with it, and thus to blunt the acrimony of the phlegm.

CANDYING, in pharmacy, the act of preſerving ſimples in ſubſtance, by boiling them in ſugar.

The performance of this originally belonged to the apothecaries, but is now become a part of the buſineſs of a confectioner.

CANDY-TUFT, in botany, a low-growing annual plant, uſually ſown in the ſpring, in patches, for the ornament of the flower-garden. There are two ſorts, one with purple flowers, and the other with white: both make an agreeable appearance when in bloſſom, and are a ſpecies of the iberis, which ſee.

Tree CANDY-TUFT. See the article IBERIS.

CANE, a ſort of walking-ſtick, of which ſome are without knots, and very ſmooth and even; others are full of knots, about two inches diſtant from each other. Theſe laſt have very little elaſticity, and will not bend ſo well as the others.

CANE ARUNDO, in botany. See the article REED.

CANE, *Canna*, is alſo the name of a long meaſure, which differs according to the ſeveral countries where it is uſed.

At Naples, the cane is equal to 7 feet $3\frac{1}{2}$ inches Engliſh meaſure; the cane of Tholouſe, and the Upper Languedoc, is equal to the varre of Arragon, and contains 5 feet $8\frac{3}{4}$ inches; at Montpelier, Provence, Dauphine, and the Lower Languedoc, to 6 Engliſh feet $5\frac{1}{4}$ inches.

CANELLA ALBA, wild cinnamon, in the materia medica, the inner bark of a large bay-leaved tree, growing in the Low-lands of Jamaica, and other American iſlands, brought over in the form of quills; of which ſome are large and thick, taken from the trunk of the tree; others ſlenderer and thinner, from the branches, having generally pieces of a wrinkled browniſh coat adhering to the outſide, lined on the inſide with a fine white membrane, breaking over with a cloſe even ſurface, and appearing internally of an unequal, pale, browniſh or yellowiſh white colour.

Canella alba has hitherto been rarely employed in medicine, unleſs as a ſubſtitute for winter's bark, which it pretty much reſembles, and has been commonly miſtaken for. The London college has now received it in two officinal compoſitions for alleviating the ill flavour of aloes. It is a moderately warm aromatic, of an agreeable ſmell, ſomewhat reſembling that of cloves, but far weaker; and of a pungent taſte, accompanied with a conſiderable bitterneſs.

CANEPHORÆ, in Grecian antiquity, virgins who, when they became marriageable, preſented certain baſkets full of little curioſities to Diana, in order to get leave to depart out of her train, and change their ſtate of life.

CANEPHORIA, in Grecian antiquity, a ceremony which made part of a feaſt celebrated by the Athenian virgins, on the eve of their marriage day.

CANEPHORIA is alſo the name of a feſtival of Bacchus, celebrated particularly by the Athenians, on which the young maids carried golden baſkets full of fruit; which baſkets were covered to conceal the myſtery from the uninitiated.

CANES VENALICI, or THE TWO HOUNDS, in aſtronomy, a new conſtellation of the northern hemiſphere. Theſe two hounds are repreſented on the globe coupled together by the neck, and held in a ſtring by Bootes. This conſtellation contains twenty-five ſtars, their places, &c. are as in the following catalogue.

Order.	Magn.	Name.	Bayer Let.	Right Aſcenſion.	Diſtance from Nor. Pole.	Var. in Right Aſcen.	Var. in Declination
				° ′ ″	° ′ ″	″	″
1	5			180.44.17	35.13.25	44.5	20.0
2	6			181. 4.49	48. 0. 5	44.2	20.0
3	6			181.59.42	39.40.35	43.0	20.0
4	6			183. 0.27	46. 7.20	43.5	20.0
5	6			183. 5.57	37. 6.25	43.2	20.0
6	5		*e*	183.30.37	49.38.40	43.5	20.0
7	7			184.43.16	37. 7.53	42.5	20.0
8	4.5		*b*	185.36.31	47.20.40	42.7	19.9
9	6.7			186.49. 6	47.47.46	42.5	19.9
10	6			188.25.16	49.25. 8	42.0	19.9
11	6			189.26.38	40.13. 3	41.0	19.9
12	2.3		A	191.12. 5	50.23. 0	41.2	19.7
13	4.5		*c*	192.10.46	57.54.56	42.0	19.7
14	5		*d*	193.37.27	52.54.31	41.0	19.6
15	6.5			194.41.10	50.11. 1	40.2	19.5
16	6			194.46.23	59. 9.51	40.2	19.5
17	6			194.46.38	50.13. 0	40.2	19.4
18	6			194.53.47	47.55.24	40.0	19.4
19	7			196 11.54	47.52. 9	40.0	19.3
20	6			196.43.18	48. 9. 2	40.0	19.2
21	6			197. 0.48	39. 3. 4	37.2	19.2
22	6			197. 0.48	38. 3. 4	37.5	19.1
23	7			197.24.53	48.35. 3	39.2	19.0
24	5.6		*v*	201.11.23	39.45. 4	36.0	18.7
25	5		*b*	201.38.13	42.38.56	37.7	18.6

CANICULA, in aſtronomy, the ſame as canis minor. See CANIS MINOR.

CANICULAR Days, are thoſe days, or that

ſpace of time, taken up by the ſun in paſſing the conſtellation Canis major, or all thoſe days in which the ſun and ſome part of Canis major paſs the meridian together, at which time Syrius, or the dog-ſtar, and the ſun riſe and ſet nearly together; from hence they likewiſe are called the Dog-days.

The ancients, when they obſerved the heliacal riſing of Syrius, uſually ſacrificed a brown dog, to appeaſe its rage; for they ſuppoſed it to be the cauſe of the hot, ſultry weather, uſually felt in the dog-days: but this ſuppoſition muſt certainly be abſurd, for in time the dog-days will happen in winter; therefore, for the ſame reaſon, they muſt ſuppoſe it the cauſe of froſt and ſnow.

Among the Egyptians, (if we may believe ſeveral hiſtorians) there were more ſtars than Syrius, which they called Canicula, or the Dog-ſtar, and by which their magi prognoſticated the future events of the year. There was one which went under the name of Thot, and ſometimes Anubis, ſituated near Cancer, which they ſuppoſe cauſed the ſwelling and ſinking of the river Nile. They uſually denoted the obſervation of the dog-ſtar by the figure of a ſerpent. The figure of Anubis or Thot they uſually accompanied with a full purſe, the ſight whereof filled the people with joy.

Canicular Year, among the Egyptians, denotes their natural year, which was computed by one heliatical riſing of the dog-ſtar to the next. This is called *Annus canarius* and *Annus cynicus*; by the Egyptians themſelves the *Sothic year*, from *Soth*, a denomination given by them to Syrius. Some alſo call it the *Heliacal year*. The canicular year conſiſted ordinarily of three hundred and ſixty-five days; and every fourth year of three hundred and ſixty-ſix days, by which it was accommodated to the civil year.

The reaſon of their choice of the dog-ſtar, or Syrius, to compute their time by, was not only the ſuperior brightneſs of that ſtar, but becauſe its heliacal riſing was in Egypt at a time of ſingular note, as falling on the greateſt augmentation of the Nile, the reputed father of Egypt.

CANINE, whatever partakes of, or has any relation with, the nature of a dog. Thus,

Canine Teeth, in anatomy, are two ſharp-edged teeth in each jaw; one on each ſide, placed between the inciſores and molares.

Canine Muscles, a pair of muſcles common to both lips. They ariſe from the hollow on each ſide under the os jugalis, in the os maxillare, and are inſerted into the angle of the lips.

Canine Appetite. See Bulimy.

CANIS, dog, in zoology, the name of a comprehenſive genus of quadrupeds, of the order of the feræ.

They are diſtinguiſhed from the other genera of this order, by the number of their teats, or paps, which in the dog kind are ten, four on the breaſt, and ſix on the belly: add to this, that their feet are adapted to running; they have five toes on the fore ones, and four on the hinder.

Canis Major, *or the Great Dog*, in aſtronomy, a conſtellation of the ſouthern hemiſphere, which, according to Ptolemy, contains twenty-eight ſtars, Tycho thirteen, and the Britiſh catalogue thirty-one.

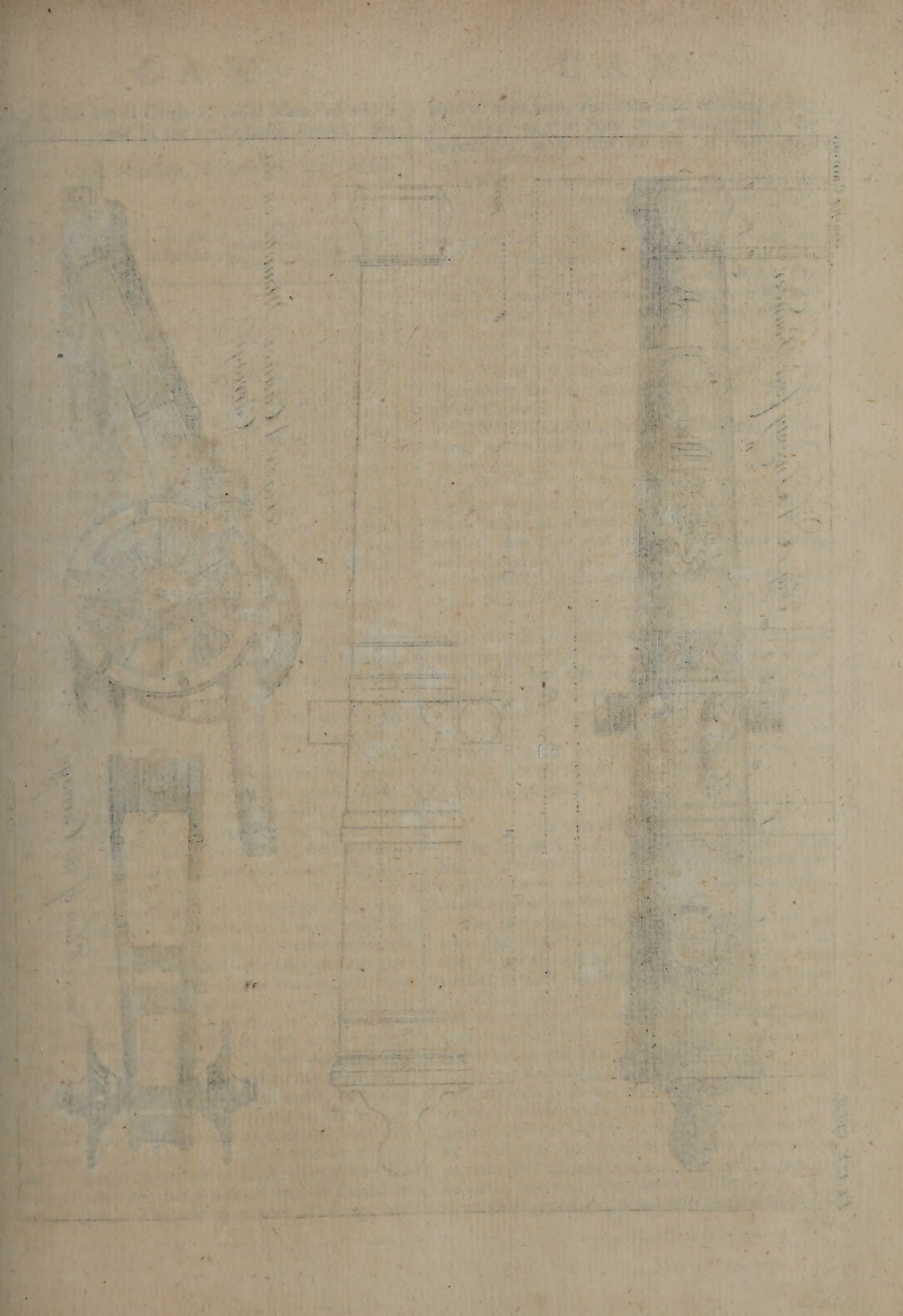
The poets tell us, this was the dog that Jupiter ſet to keep Europa after he had ſtolen her away, and conveyed her into Crete; and for his good ſervices placed him in heaven. Others ſay, it was one of the dogs of Orion; and Novidius will have it to be Tobias's dog.

The right aſcenſion, &c. of the ſtars in this conſtellation to the year 1770, is as follows.

Order.	Magn.	Name.	Bayer. let.	Right Aſcenſion	Diſtance from Nor. Pole.	Var. in Right Aſcen.	Var. in Declination.
				° ′ ″	° ′ ″	″	″
1	3		ξ	92.50.41	119.57.30	38.0	1.0
2	2		β	93. 3.37	107.50. 3	40.3	1.1
3	4		λ	93.24. 9	123.18.40	31.5	1.4
4	5	1ma ad	ξ	95.28.35	113.15.11	36.0	1.7
5	5	2da ad	ξ	96.15.46	112.47.11	36.2	1.9
6	5	1ma ad	ν	96.28.59	108.28.17	37.2	2.3
7	5	2da ad	ν	96.33.47	109. 3.48	37.5	2.6
8	5	3tia ad	ν	96.50.54	108. 2.36	38.0	2.8
9	1	Syrius	α	98.40.13	106.22.25	40.4	3.0
10	6	1ma ad	κ	98.59.43	120.50.31	32.7	3.1
11	5			98.59. 0	104.10.55	39.2	3.2
12	6		ℓ	99.10.11	110.46.51	37.0	3.3
13	5	2da ad	κ	100. 6.19	122.14.31	32.2	3.4
14	5		θ	100.46. 6	101.43.59	40.2	3.5
15	6	1ma ad	π	100.47. 2	109.57.23	37.2	3.6
16	5	1ma ad	o	101. 2.48	113.53.34	36.0	3.7
17	6	2da ad	π	101. 9.59	110. 7.32	37.2	3.8
18	4		μ	101.17.31	103.44.43	39.5	3.9
19	6	3tia ad	π	101.18.35	109.51.17	37.2	4.1
20	4		ι	101.22.36	106.46.21	38.5	4.3
21	3.2		ε	102.15.53	118.39. 4	34.0	4.4
22	4			103. 0.14	117.35.57	34.2	4.5
23	3		γ	103.14. 9	105.17.21	40.8	4.6
24	5.4	2da ad	o	103.15.21	113.29.41	36.0	4.8
25	2.3		δ	104.37.17	116. 1.16	36.7	5.1
26	7			105.34.21	115.32.59	35.2	5.3
27	7			106. 5.42	115.56.42	35.0	5.6
28	5			106.14.53	116.22.45	35.0	5.8
29	5			107. 8.46	114. 7.46	36.0	6.0
30	5			107. 9.59	114.31.13	35.7	6.2
31	3.2		η	108.37.35	118.50.30	35.7	6.4

Canis Minor, *or the Leſſer Dog*, in aſtronomy, a conſtellation of the northern hemiſphere, which, according to the Britiſh catalogue, contains fourteen ſtars.

According to the fabulous ſtories of the poets, this



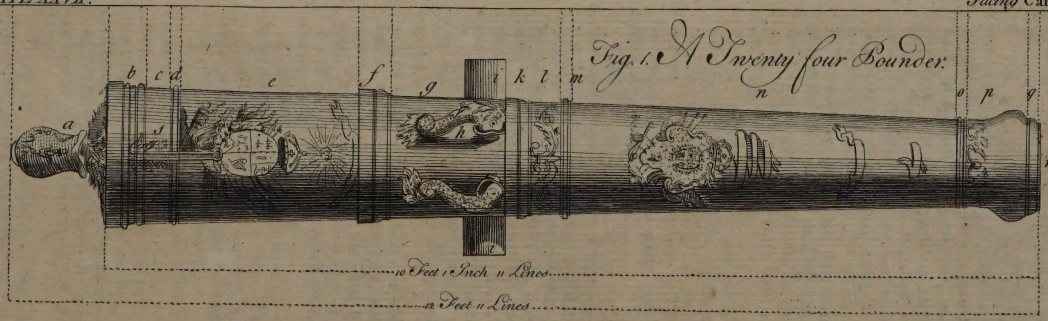


Fig. 1. A Twenty four Bounder.

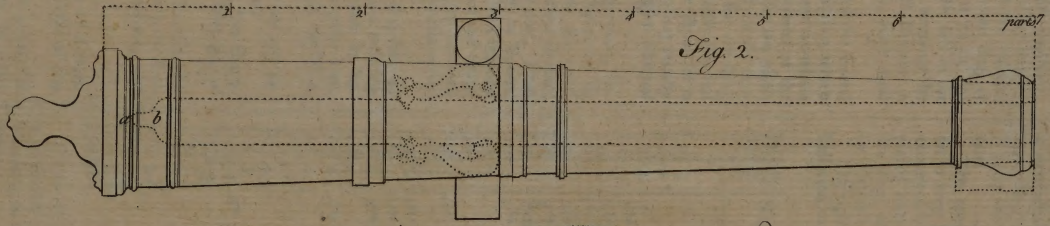


Fig. 2.

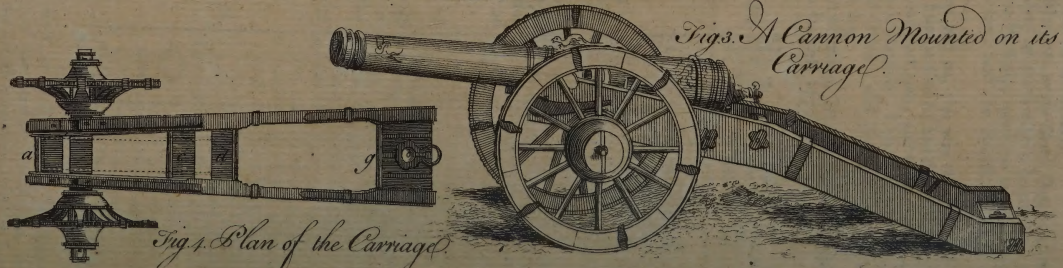


Fig. 4. Plan of the Carriage.

Fig. 3. A Cannon Mounted on its Carriage.

this is the dog of Origone, called Mera, of which mention is made in the conſtellation Bootes. See BOOTES.

The right aſcenſion, declination, &c. as follows.

Order.	Magn.	Name.	Bayer Let.	Right Aſcenſion	Diſtance from Nor. Pole.	Var. in Right Aſcen.	Var. in Declination.
				° ′ ″	° ′ ″	″	″
1	7.6		ε	107.53.55	77.53. 5	48.0	6.3
2	6		β	108. 7.26	80.16.18	49.6	6.4
3	3			108.40.51	81.14.37	47.0	6.4
4	6		γ	108.45.23	80.36.31	47.2	6.5
5	6		η	188.46. 0	82.36. 5	46.5	6.7
6	6		ο	109. 5.50	77.31. 4	48.2	6.8
7	6	1ma ad	δ	109.53.56	87.35.49	45.0	6.9
8	6	2da ad	δ	110. 7.11	86.13. 3	45.2	7.0
9	6	3tia ad	δ	110.21.22	86. 7.38	45.5	7.2
10	1.2	Procyon	α	111.41.22	84. 9.20	46.0	7.3
11	6		π	113.14.34	78.39.48	47.7	7.8
12	5.6			114.45.17	76.50.17	48.2	8.2
13	5		ξ	114.48.38	87.38. 7	45.0	8.3
14	6			116.28.20	87. 9. 6	45.0	9.0

CANISTER, a large tin-box, in which tea is brought from China. They are of ſeveral ſizes, holding from one pound to ten of that vegetable.

CANKER, a ſpeck made of a ſharp humour, which gnaws the fleſh almoſt like a cauſtic; very common in the mouths of children.

CANKER *in Trees*, a term uſed by our farmers to expreſs a wound or blemiſh in the trunk of a tree, which does not heal up by nature, but will increaſe and damage, if not endanger, the whole tree. Theſe wounds are ſometimes occaſioned by accidents, as blows, or by the branches of one tree galling another by the motion they are put into by the winds; if this latter be the caſe, the offending branch muſt be cut off, or drawn another way, or elſe all remedies are vain.

The wound muſt be cut and enlarged every way to the quick, and all the decayed wood muſt be taken clean out; then the whole internal ſurface of the wound muſt be rubbed over with tar mingled with oil; and after this it muſt be filled up with clay and horſe-dung mixed together, or with horſe-dung alone, which many eſteem beſt of all; in this caſe the dung muſt be bound over with a rag: hogs-dung is by many preferred to horſe-dung for this purpoſe; and it is proper to add to this application the keeping of the roots cool and moiſt, by laying fern and nettles about them. If the canker be only in one of the boughs of the tree, the ſhorteſt way is to cut off the bough at once; if that be a large one, it ſhould be cut off at ſome diſtance from the body of the tree; but if a ſmall one, it ſhould be cut off cloſe. The adding a coat of dung, and pond or river mud, about the roots of trees, if they are ſubject to this from their ſtanding in a dry barren land, as is often the caſe, is a very good cure.

CANNA, in botany, a genus of plants; the flower of which is monopetalous, and divided into ſix parts. The laciniæ are lanceolated, cohering at the baſes, of which the three exterior ones are erect; the three interior ones are longer than theſe, and two of them are erect, and one reflex. The fruit is a roundiſh, ſcabrous, coronated, triſulcated capſule, with three cells and three valves, containing ſome globoſe ſeeds.

CANNABIS, hemp, in botany. See HEMP.

CANNACORUS, in botany, the name uſed by Tournefort for the canna of Linnæus. See the article CANNA.

CANNEL-COAL, in natural hiſtory, a ſubſtance which has a long time, though with very little reaſon, been confounded, both by authors and druggiſts, with jet. It is dug up in many parts of England in great abundance, particularly in Lancaſhire, where it is burnt as common fuel. It is worked into toys and utenſils of various kinds, under the name of jet.

CANNEQUINS, white cotton-linens brought from the Eaſt-Indies, a very proper commodity for trading on the coaſt of Guinea.

CANNON, in military affairs, the machines uſed with gunpowder, were at firſt called cannon, or bombards: but this cuſtom has long ſince been changed. That which is now called a cannon is a fire-arm of braſs or iron, long and round, concave within, and thicker at the end oppoſite to its opening than at the opening, which is called its mouth. See the article ARTILLERY.

Its principal parts are,

PLATE XXVII, Fig. 1.

The breech A, and its button, or caſcabel. The breech is the ſolid metal from the bottom of the concave part to the caſcabel, which is the extremity of the cannon oppoſite to its mouth.

The trunnions I. ſtand out on each ſide like an arm, and ſerve to ſupport the cannon: on theſe it may be poiſed, and held almoſt in equilibrio; I ſay almoſt, becauſe the breech-end ought to be about the thirtieth part of the weight of the piece heavier than the other: as the metal is thicker at the breech than towards the mouth, the trunnions are placed nearer to the end than the other.

Fig. 2. Repreſents a twenty-four pounder divided longitudinally with the bore or chaſe, which is all the interior or concave part of the cannon; and the little chamber of the breech that receives the powder by which the cannon is fired. In a twenty-four pounder this chamber is one inch and a half in diameter, and two inches and a half in depth; and in a ſixteen pounder it is one inch in diameter, and

one

one inch ten lines in depth. The pipe of the touch-hole comes into this little chamber at about nine lines from its inmoſt receſs in twenty-four pounders, and at about eight in ſixteen pounders.

The pipe of the touch-hole is an aperture made near the breech, through the whole thickneſs of the metal, by which the powder is fired that lies within the cannon. This hole is made in a ſmall cavity reſembling the inſide of a ſcollop ſhell, ſunk for that purpoſe in the upper-part of the piece.

The ears, or handles P, called by us maniglions, or dolphins, are two rings, of the ſame metal with the piece, placed as the trunnions, only ſomething near the breech, made in the ſhape of dolphins, ſerpents, &c. Through theſe is put a rope to raiſe or move, mount or diſmount, the cannon, which, ſuſpended on the handles, ought to be in equilibrio; that is, the breech ought not to be heavier than the mouth.

Names of the other parts of the cannon.

b. The platband and moulding of the breech.

c. The region of the touch-hole.

d. The aſtragal of the touch-hole.

e. The firſt renfort.

f. The platband and moulding of the firſt renfort.

g. The ſecond renfort.

k. The platband and moulding of the ſecond renfort.

l. The cincture or ornament of the chain.

m. The aſtragal of the cincture.

n. The chain.

o. The neck aſtragal.

p. The neck with the border in tulip-work, [peculiar to the French.]

q. The crown with its mouldings.

r. The mouth.

Theſe cannon diſcharge, by means of gunpowder, globes or balls of iron, called bullets.

The metal of which cannon are made, is a compound of copper, braſs, and tin. The reſpective quantities of each of theſe, which ſhould enter into this compoſition, is a point not decided; every founder has his own propoſitions, which are peculiar to himſelf: but the common proportion of theſe ingredients to a quantity of metal, is one-third of copper, one-fourth of braſs, and one-ſeventh of tin; for example, to two hundred and four pounds of metal fit for caſting, they put ſixty-eight pounds of copper, fifty-two pounds of braſs, and twelve pounds of tin.

With reſpect to iron cannon, their ſtructure is the ſame with the other; they are not however capable of the ſame reſiſtance as thoſe of braſs, but they coſt much leſs. Theſe are commonly uſed on ſhip-board, and on ſome occaſions on ſhore.

Cannon are of different ſizes, in proportion to which they diſcharge bullets of more or leſs weight.

Cannon were formerly made to carry a thirty-three pound, a forty-eight pound, and even a ninety-ſix pound bullet; and M. Saint Remy obſerves, in his Memoirs, that there is ſtill one of this laſt ſort in the city of Straſburg; but the largeſt battering-pieces now commonly caſt are thoſe which carry a bullet of twenty-four pounds weight, and which are therefore called twenty-four pounders; and the largeſt made on board his majeſty's ſhips are forty-two pounders; but theſe are generally braſs, and confined to ſhips of the firſt rate in our navy.

Cannon generally take their names from the weight of the bullets which they diſcharge; thus a piece that diſcharges a bullet of twenty-four pounds, is called a four-and-twenty pounder; one that carries a bullet of ſixteen pounds, is called a ſixteen pounder; and ſo of the others.

Cannon are alſo diſtinguiſhed by the diameter of the mouth, or bore, which is generally called the caliber of the piece; ſo if this diameter is three, four inches, &c. the cannon is ſaid to be a piece of three, four, &c. inches caliber.

The diameter of the bullet, or ball, ought to be about two lines, or two-twelfths of an inch, at leaſt leſs than the bore of the piece, that it may be diſcharged with the greater eaſe, and not damage the piece by rubbing it too forcibly in its paſſage; this is called the vent of the bullet.

When the diameter of a bullet and its weight are known, it is eaſy to find the weight of all bullets, having the diameter given, and the diameter of all bullets, if the weight be given. Geometry has furniſhed certain rules for effecting this, which are mentioned among the uſes of the ſector.

The twenty-four pounders are uſed in ſieges to batter and deſtroy fortifications; their length is eleven feet, including the length of the caſcabel; and their weight ought to be five thouſand four hundred pounds, or upwards; their bore is about five inches, eight line, and conſequently the bullets they carry are about five inches, ſix lines diameter.

Beſides theſe pieces of twenty-four pounders, there are others, viz. ſixteen, twelve, eight, and four pounders.

The ſixteen pounders are called demi-cannon, or culverins; their bore is four inches, eleven lines; they carry balls of four inches, nine lines diameter; their length is about ten feet, ſix inches, and their weight four thouſand, two hundred pounds at moſt: there are ſome longer, and, among others, the piece, called the culverin of Nancy, from its having been caſt in that city.

It is now common to call any piece a culverin, which is longer than other pieces of the ſame bore.

The twelve pounder carries bullets of four inches, three lines diameter; its length is about ten feet, and its weight three thouſand two hundred pounds at moſt.

The eight pounder is called a baſtard or demi-cannon; its length is about eight feet, ten inches; its weight ought to be two thouſand, one hundred pounds at moſt; it carries a ball of about three inches, ten lines diameter.

The four pounder, moyenne, or middle ſize, ought to be ſeven feet, three inches in length; its bore is about three inches, two lines, and by, conſequence, the bullet it carries is no more than three inches diameter; the weight of this piece ought to be one thouſand, one hundred and fifty pounds.

Beſides theſe pieces, there are others ſtill leſs, that carry from two pounds to a quarter of a pound ball; theſe are called falconets: their length is about ſeven feet, and their weight varies from eight hundred down to one hundred and fifty pounds.

The metal of cannon is not equally thick in all parts, but is in ſome meaſure proportioned to the force of the powder which it is to reſiſt; at the breech, where the effort is ſtrongeſt, the thickneſs of the metal is equal to the diameter of the bullet of the piece; at the firſt renfort, where the force begins to diminiſh, the thickneſs is ſomewhat leſs than at the breech; at the ſecond, where the force is further diminiſhed, the thickneſs is leſs than at the firſt; and, by the ſame rule, the chace has leſs thickneſs than the ſecond renfort. The thickneſs of the chace gradually diminiſhes from the trunnions to the mouth of the piece. If a cannon was without caſcabel, or button, trunnions, and mouldings, it would exactly reſemble the fruſtum of a cone, or a cone, the ſmall end being cut off.

If the diameter of the ball be divided into twelve equal parts, the thickneſs of the metal at the breech of the piece will be equal to the whole twelve; to eleven at the end of the firſt renfort, nine and a half at the end of the ſecond, ſeven and a half at the neck aſtragal, the ſame at the extremity of the chace; and at the greateſt protuberance of the border, or moulding at the muzzle, eight and a half.

With reſpect to the length of the piece, if it is divided into ſeven equal parts, from the extremity of the platband of the breech, to the extremity of the mouth, the firſt renfort will be two of theſe parts; the ſecond renfort will terminate at the end of the third part, which is alſo the place of the trunnions; and the four remaining parts will be the length of the chace.

The length and thickneſs of each trunnion are equal to the diameter of the piece, and the length of the caſcabel is two diameters of the bullet.

All theſe proportions have been eſtabliſhed by experience, which has ſhewn, that cannon, in which they were nearly obſerved, have been capable of doing good ſervice; I ſay nearly, becauſe they are not kept with a geometrical exactneſs. *Le Blond's Elements of War.* See the articles CARRIAGE, CHAMBER, and CHARGE.

CANNULA, in ſurgery, a tube made of different metals, principally of ſilver and lead, but ſometimes of iron.

They are introduced into hollow ulcers, in order to facilitate a diſcharge of pus or any other ſubſtance; or into wounds, either accidental or artificial, of the large cavities, as the thorax or abdomen: they are uſed in the operation of bronchotomy, and by ſome, after cutting for the ſtone, as a drain for the urine.

Other cannulas are uſed for introducing cauteries, either actual or potential, in hollow parts, in order to guard the parts adjacent to that to be cauterized from injury. They are of various figures; ſome being oval, ſome round, and others crooked.

CANOE, in the marine, a ſort of Indian boat or veſſel formed of the trunk of a tree hollowed, and ſometimes of ſeveral pieces of the bark faſtened together.

Canoes are of various ſizes, according to the countries where they are formed, or the uſe for which they may be deſigned: the largeſt are made of cotton-tree, ſome of which will carry between twenty or thirty hogſheads of ſugar or molaſſes: ſome are made to carry ſail, and for this purpoſe are ſteeped in water till they become pliant, and then their ſides are extended with ſtrong beams, on which a deck is afterwards laid. The other ſorts very rarely carry ſail, unleſs when going afore the wind; their ſails, for this purpoſe, are ſometimes made of a kind of ruſhes or ſilk-graſs. They are commonly rowed with paddles, which are pieces of light wood, ſomewhat reſembling a corn-ſhovel; and inſtead of wielding the paddle horizontally, like an oar, they row perpendicularly. The ſmall canoes are very narrow, having only room for one perſon in breadth, and eight or nine lengthways. The rowers, who are generally negroes or American ſavages, are very expert in moving their paddles uniformly, and in ballancing them properly with their bodies, which would be difficult for a ſtranger to do, how well accuſtomed ſoever to the management of European boats, becauſe the canoes are extremely light, and liable to be overturned.

The American Indians, when they are neceſſitated to land, to avoid a water-fall, or to croſs the land from one river to another, carry their canoes on their heads, till they arrive at a place where they can launch them again.

There is a Greenland canoe in the repoſitory of the Royal Society covered with ſeal-ſkins, and reſembling a great bladder, ſo that however the waves daſh over it, the perſon who manages it ſits ſafe.

CANON, in eccleſiaſtical affairs, a perſon who poſſeſſes a revenue allotted for the performance of divine ſervice in a cathedral or collegiate church.

CANON *of Scripture*, a catalogue or liſt of the inſpired writings, or ſuch books of the Bible as are called canonical, becauſe they are in the number of

thoſe

thoſe books which are looked on as ſacred, in oppoſition to thoſe which either are not acknowledged as divine books, or are rejected as heretical and ſpurious, and are called apocryphal.

The canon of Scripture may be conſidered either as Jewiſh or Chriſtian, with reſpect to the ſacred writings acknowledged as ſuch by the Jews, and thoſe admitted by the Chriſtians.

The firſt canon, or catalogue of the ſacred books, was made by the Jews; but who was the author of it is not ſo certain. The five books of Moſes were, queſtionleſs, collected into one body within a ſhort time after his death; ſince Deuteronomy, which is an abridgment of the other four, was laid in the tabernacle near the ark, according to the command he gave to the Levites: ſo that the firſt canon of the ſacred writings conſiſted only of the five books of Moſes. There were no more added to them till the diviſion of the ten tribes; ſince the Samaritans acknowledge none elſe. However, ſince Moſes, there were ſeveral prophets and other writers divinely inſpired, who compoſed either the hiſtory of their times, or prophetical books, and divine writings, or pſalms to the praiſe of God; but it cannot be diſcovered that, any time before the captivity, they were collected into one body, and comprized under one and the ſame canon. It is evident that, in our Saviour's time, the canon of the Holy Scripture was already drawn up, ſince he cites the law of Moſes, the prophets, and the pſalms, which are the three ſorts of books of which that canon is compoſed, and which he often ſtyles the Scripture, or the Holy Scripture.

It is generally received that Ezra was the principal author of this canon, though Nehemiah had ſome ſhare in it; and that he re-eſtabliſhed, corrected, and ordered the ſacred books to be written in new characters.

The Jewiſh canon is generally called the canon of Ezra; but it is certain, that all the books were not received into the canon of the Scriptures in his time; for Malachi, it is ſuppoſed, lived after him; and, in Nehemiah, mention is made of Jaddua the high-prieſt, and of Darius Codomanus, a king of Perſia, who lived at leaſt a hundred years after his time. Dr. Prideaux, with great appearance of reaſon, ſays, it is moſt probable, that the two books of Chronicles, Ezra, Nehemiah, and Eſther, as well as Malachi, were afterwards added in the time of Simeon the Juſt; and that it was not till then that the Jewiſh canon of the Holy Scripture was fully completed. And, indeed, theſe laſt books ſeem very much to want the accuracy and ſkill of Ezra, in their publication; for they fall ſhort of the exactneſs found in the other parts of the Hebrew Scriptures. There are ſome authors who pretend, that the Jews have made one or more canons; and that they have added to the former the books of Tobit, Judith, Eccleſiaſticus, Wiſdom, and the Maccabees: but it is moſt evidently true, that the Jews had no other canon but that of Ezra, nor confeſſed any other books for ſacred, but thoſe it contains. The two aſſemblies of the ſynagogue, which, as it is pretended, were held for that purpoſe, are mere chimeras; nor have any ancient writers ſaid any thing of them.

As for the Chriſtian church, there is no doubt but it acknowledged thoſe books to be canonical which were cited, as of divine authority, by Chriſt and his apoſtles; the ancient catalogues of the canonical books of the Old Teſtament, which are to be met with in Chriſtian writings, are conformable to the canon of the Jews, and contain no other books; the Chriſtian church, for ſeveral of the firſt ages, receiving the inſpired writings no farther than the Jewiſh canon. The firſt, and moſt ancient catalogue of this kind, is that of Melito, biſhop of Sardis, who flouriſhed in the reign of Marcus Antoninus. It agrees with the Jewiſh canon, excepting his omiſſion of Eſther, and that he makes Ruth and Judges two books. Origen has given us a liſt of the ſacred books, in which he takes in Eſther, and joins Ruth with Judges. St. Gregory Nazianzen divides the books of Scripture into hiſtorical, poetical, and prophetical: he reckons twelve hiſtorical books, viz. the five books of Moſes, with Joſhua, Judges, Ruth, the two books of Kings, Chronicles, and Eſdras. Five poetical books, Job, Daniel, and the three books of Solomon. Five prophetical books, viz. four great prophets, and twelve ſmall ones. The council of Laodicea was the firſt ſynod in which the number of the canonical books was aſcertained; this council aſſigns only twenty-two books to the Old Teſtament, including Eſther, and joining Baruch and the Lamentations with Jeremiah. St. Epiphanius reckons twenty-ſeven canonical books of the Old Teſtament; yet he admits no more than are in the catalogue of Origen, and obſerves that the Jews had reduced them to twenty-two. The third council of Carthage, in the year 397, admitted the books of Wiſdom, Eccleſiaſticus, Tobit, Judith, and the two books of Maccabees, into the canon. The church of Rome has agreed herein with that of Africa; for Innocent I. in his letter to Exuperius, places the ſame books in the canon of Scripture, as pope Gelaſius, in the council held in the year 494; and the decree of pope Eugenius, and the canon of the council of Trent, agree with the canon of the council of Carthage. That the council of Trent had no prior authority to proceed on, excepting ſome ſlender pretence from the council of Carthage abovementioned, appears from the current teſtimony of the Latin church.

As to the canon of the New Teſtament, it is to be obſerved, that the four Evangeliſts, the Acts of the Apoſtles, all the Epiſtles of St. Paul, except that to the Hebrews, and the firſt Epiſtles of St. Peter and St. John, have been received as canonical by

by the unanimous consent of all the churches in all times; the Epistle of St. James, that of St. Jude, the second Epistle of St. Peter, and the second and third Epistles of St. John, were not received by all the churches from the beginning, as canonical; but have since been acknowledged as genuine, and therefore admitted into the canon.

We must observe that the canon of the New Testament was neither settled by any synod, or single authority; this collection was formed upon the unanimous consent of all the churches, who, by constant tradition, reaching to the apostolical age, had received such a number of them as were written by inspired authors.

CANON, in monastic orders, a book wherein the religious of every convent have a fair transcript of the rules of their order frequently read among them, as their local statutes.

CANON is also used for the catalogue of saints acknowledged and canonized in the Romish church.

CANON, in music, a short composition of two or more parts, in which one leads, and the other follows: or it is a line of any length, shewing, by its divisions, how musical intervals are distinguished according to the ratios, or proportions, that the sounds terminating the intervals bear one to another, when considered according to their degree of being acute or grave.

CANON, in arithmetic, is a rule to solve all things of the same nature with the present enquiry: thus every last step in algebra is such a canon; and if turned into words, is a rule to solve all questions of the same nature with that proposed. The tables of logarithms, artificial signs, tangents, &c. are called likewise by the same name of canon.

CANON-LAW, a collection of ecclesiastical laws, serving as the rule and measure of church government.

The power of making laws was exercised by the church before the Roman empire became Christian. The canon-law that obtained throughout the West, till the twelfth century, was the collection of canons made by Dionysius Exiguus, in 520, the capitularies of Charlemaign, and the decrees of the popes, from Siricius to Anastasius.

The canon-law, even when papal authority was at its height in England, was of no force when it was found to contradict the prerogative of the king, the laws, statutes, and customs of the realm, or the doctrine of the established church. The ecclesiastical jurisdiction of the see of Rome in England was founded on the canon-law; and this created quarrels between kings and several archbishops and prelates, who adhered to the papal usurpation.

Besides the foreign canons, there were several laws and constitutions made here for the government of the church; but all these received their force from the royal assent; and if at any time the ecclesiastical courts did, by their sentence, endeavour to enforce obedience to such canons, the courts at common law, upon complaints made, would grant prohibitions. The authority vested in the church of England of making canons, was ascertained by a statute of Henry VIII. commonly called the act of the clergy's submission; by which they acknowledged that the convocation had been always assembled by the king's writ; so that though the power of making canons resided in the clergy, met in convocation, their force was derived from the authority of the king's assenting to, and confirming them.

The old canons continued in force till the reign of James I. when the clergy being assembled in convocation, the king gave them leave to treat and consult upon canons; which they did, and presented them to the king, who gave them the royal assent: these were a collection out of the several preceding canons and injunctions. Some of these canons are now obsolete. In the reign of Charles I. several canons were passed by the clergy in convocation.

CANONESS, in the Romish church, a woman who enjoys a prebend, affixed, by the foundation, to maids, without their being obliged to renounce the world, or make any vows.

CANONESSES *of St. Augustine*, or *Royal* CANONESSES, a kind of religious, who follow the order of St. Augustine, of which there are various congregations.

CANONICAL, something belonging to, or partaking of, the nature of a canon: thus we read of canonical obedience, which is that paid by the inferior clergy to their superiors, agreeably to the canon-law. See the article CANON-LAW.

We also meet with canonical life, canonical hours, &c. used much in the same sense.

CANONICUM, in the Greek church, the name given to certain fees paid by the clergy to their prelates, for degrees of promotion.

CANONIST, a person skilled in, or who makes profession of the canon-law. See the article CANON-LAW.

CANONIZATION, a ceremony in the Romish church, by which persons deceased are ranked in the catalogue of the saints.

CANONRY, the benefice filled by a canon. It differs from a prebend, in that the prebend may subsist without the canonicate; whereas the canonicate is inseparable from the prebend: again, the rights of suffrages, and other privileges, are annexed to the canonicate, and not to the prebend.

CANOPY, a magnificent covering, raised above an altar, throne, chair of state, pulpit, and the like.

The word canopy comes from the Greek κωνωπειον, a net spread over beds to keep off the gnats, from κωνωψ, a gnat.

CANQUES, a sort of cotton cloth made in China, which they wear next their skin, and is properly their shirt.

CANTA-

CANTALIVERS, in architecture, the ſame nearly as modillions, only the one is plain and the other carved. They are both a kind of cartouzes ſet at equal diſtances under the corona of the cornice of a building. Cantalivers which project much are at preſent out of faſhion, and with good reaſon, eſpecially in London-Streets, as they darken, by their hanging over, the upper chambers at leaſt; and are apt to ſpread and communicate fire in caſe of a misfortune of that ſort: and beſides, uſe, conveniency, and ſimplicity are more laudibly ſtudied than mere ornament.

CANTAR, or CANTARO, in commerce, a weight uſed in Italy, particularly at Leghorn, to weigh ſome ſorts of merchandizes.

There are three ſorts of cantari, or quintals, one weighs one hundred and fifty pounds, the other one hundred and fifty-one, and the third an hundred and ſixty: the firſt ſerves to weigh alum and cheeſe, the ſecond is for ſugar, and the third for wool and cod-fiſh.

CANTATA, in muſic, a ſong or compoſition, intermixed with recitatives, airs, and different movements, chiefly intended for a ſingle voice, with a thorough baſs, though ſometimes for other inſtruments.

CANTERBURY BELL-FLOWER, in botany, the Engliſh name for a ſpecies of the campanula. It is a biennial plant, with oblong rough hairy leaves, which are ſerrated on their edges. From the center ariſes a ſtiff, hairy, furrowed ſtalk, ſending out ſeveral lateral branches from the bottom upwards, which are garniſhed with long, narrow, hairy, ſerrated leaves, placed alternately. From the places where the leaves put forth iſſues out the flowers on foot-ſtalks, diminiſhing gradually upwards in a pyramidical form. Theſe are large, and bloſſom in June. This plant is propagated by ſeeds ſown in the ſpring.

CANTHARIDES, in the materia medica, a beautiful kind of fly or winged inſect, of a bright, ſhining, greeniſh, golden colour, with ſome admixture of bluiſh. They were formerly brought from Spain, and hence are ſtill commonly called Spaniſh flies. They are not, however, peculiar to that kingdom, France, ſome parts of Germany, and other countries, produce abundance. It is principally in the ſpring, and on the poplar and aſh-trees, that they are met with.

The uſual way of killing them is by the ſteam of ſtrong or diſtilled vinegar. The flies are put into a clean pot, which is covered with a hair cloth, and then inverted upon another pot containing the vinegar warmed by a little fire made underneath, the juncture of the two pots being cloſely luted to confine the ſteam. The flies are afterwards thoroughly dried, and packed up ſecure from the air. In long keeping, they fall by degrees into a greyiſh or browniſh light powder, and in this ſtate are unfit for uſe, their intrinſic qualities periſhing with their external form. The wings are the moſt permanent part, theſe remaining entire after the body of the fly has mouldered into duſt.

Cantharides, when freſh, have a ſtrong fetid ſmell: taſted, they make at firſt no impreſſion upon the tongue, but in a little while they diſcover a degree of acrimony, and a kind of pitchy flavour. Applied to the ſkin, they raiſe a bliſter on the part. The uſual bliſtering-plaſters are compoſed of powdered cantharides and ſome common plaſter, in the proportion of one part of cantharides, or two, ſix, eight, or more of the plaſter, according as the compoſition is required to be more or leſs active.

Taken internally, in the doſe even of a few grains, they generally occaſion violent irritation and inflammations. They act in a peculiar manner upon the kidneys, and the urinary and ſeminal veſſels: when applied only externally as a bliſter to remote parts, they often affect the bladder, and bring on a difficulty and pain in making water. They are nevertheleſs given inwardly in ſmall doſes, both with ſafety and advantage, in ſome refractory diſorders, which baffle the force of medicines of leſs activity. Dr. Grœneveld, who was impriſoned in England for having ventured to exhibit them, publiſhed a treatiſe in defence of his practice and of the utility of the medicine. He employs camphor for correcting the virulence of the cantharides; but the beſt remedies againſt the ill effects of this, as of other ſtimulating drugs, are milk and expreſſed oils.

CANTHI, in anatomy, cavities at the extremities of the eye-lids, commonly called the corners of the eye: the greater of them, or the greater canthus, is next the noſe; the leſſer, or the little canthus, lies towards the temple.

CANTHUS, in chemiſtry, the lip of a veſſel, or that part of it which is a little hollowed or depreſſed, for the eaſy pouring off of liquors.

CANTICLES, a canonical book of the Old Teſtament. The Talmudiſts aſcribe it to Hezekiah, but the learned are agreed that king Solomon was the author of it; and his name is prefixed to it in the title of the Hebrew text, and of the ancient Greek verſion.

It is a kind of epithalamium, in the form of an idyllium or bucolic, in which are introduced, as ſpeakers, a bridegroom, a bride, the friends of the bridegroom, and the companions of the bride. The bridegroom and bride expreſs their love for each other in very tender and affectionate terms; for which reaſon the Jews never allowed this book to be read by any, till they were at leaſt thirty years of age.

Some authors are of opinion, that Solomon's deſign in this piece, was to deſcribe his amour with the Shunamite, or with the daughter of Pharaoh: on the contrary, others take it to be wholly allegorical, and underſtand it of the ſpiritual love of God towards

wards his church. Some have pretended to discover in it five scenes; but others, with more justness, distinguish it into seven days, during which the ancients celebrated their nuptials.

CANTIMAROUS, or CATIMAROUS, a kind of raft made of three or four hollowed trunks of trees, tied together with ropes of cocoa, with a triangular sail in the middle made of mats. They are used by the inhabitants of the coast of Coromandel, to go a fishing, and to trade along the coast.

CANTO, in music, the treble, or at least the higher part of the piece.

This word more properly signifies the first treble, unless the word *secundo*, for the second, or *ripieno*, for the treble of the grand chorus, be added.

CANTO-CONCERTANTE, is the treble of any principal part in a concerto, and generally plays or sings throughout.

CANTONED, in architecture, is when the corner of a building is adorned with a pilaster, an angular column, rustic quoins, or any thing that projects beyond the naked part of a wall.

CANTONED, or CANTONIZED, *Cantonée*, in heraldry, the position of such things as are borne with a cross, &c. between. He bears gules, a cross argent cantoned with four scallop-shells.

CANTONING, in military affairs, the allotting distinct and separate quarters to each regiment of an army; the town, where they are quartered, being divided into so many cantons, or divisions, as there are regiments.

CANTRED, or CANTREF, signifies an hundred villages, being a British word, compounded of the adjective *cant*, that is, hundred, and *tref*, a town or village. In Wales some of the counties are divided into cantreds, as in England into hundreds.

CANT-TIMBERS, in naval architecture, the most crooked timbers in a ship; they are situated at the two ends, and are called so, from their being canted, or raised obliquely from the keel, in contradistinction to those whose planes are perpendicular to it: the upper part of those in the bow or fore-end of the ship, are inclined to the prow, as those in the after, or hind-part, incline above to the stern-post.

The principal of those last is the fashion-piece, which terminates the stern.

CANVAS, in commerce, a very clear unbleached cloth of hemp, or flax, wove very regularly in little squares. It is used for working tapestry with the needle, by passing the threads of gold, silver, silk, or wool, through the intervals or squares.

CANVAS is also a coarse cloth of hemp, unbleached, somewhat clear, which serves to cover women's stays, also to stiffen men's cloaths, and to make some other of their wearing apparel, &c.

CANVAS is also a very coarse cloth made of hemp, unbleached, serving to make towels, and answering other domestic purposes. It is also used to make sails for shipping, &c.

CANZONE, in music, signifies, in general, a song where some little figures are introduced: but it is sometimes used for a sort of Italian poem, usually pretty long, to which music may be composed in the style of a cantata. If this term be added to a piece of instrumental music, it signifies much the same as cantata: if placed in any part of a sonata, it implies the same meaning as allegro, and only denotes that part, to which it is prefixed, is to be played or sung in a brisk and lively manner.

CANZONETTA, a diminutive of canzone, denoting a little short song: the canzonette Neapolitane have two strains, each whereof is sung twice over, as the vaudevilles of the French: the canzonette Siciliane are a species of jig, the measure whereof is usually twelve-eights, and six-eights, and sometimes both are rondeaus.

CAP, a part of dress made to cover the head, and much in the figure thereof.

CAP *of Maintenance*, one of the regalia, or ornaments of state belonging to the kings of England, before whom it was carried at the coronation, and other great solemnities. Caps of maintenance are also carried before the mayors of the several cities in England.

CAP *of a Gun*, a piece of lead which is put over the touch-hole of a gun, to keep the priming from being wasted or spoiled.

CAP, in the marine, a strong thick piece of wood firmly hooped with iron, having two holes perpendicularly cut thro' it, one of which is square, and the other round. The former is firmly fixed on the upper end of the lower-mast, and the latter keeps the top-mast steddy, which slides up through it, till the heel, or lower end, reaches the top, where it is fastened. See the article FID.

In the same manner as the top-mast slides up through the cap of the lower-mast, does the top-gallant-mast slide up through the cap of the top-mast. See CAP, Plate XXVIII, *fig.* 1. See also MAST and CROSS-TREES.

CAPACITY, in a general sense, an aptitude or disposition to retain or hold any thing.

CAPACITY, in geometry, is the solid content of any body; also our hollow measures for ale, beer, wine, corn, &c. are called measures of capacity.

CAPACITY, in law, the ability of a man, or body politic, to give or take lands, or other things, or sue actions.

CAPARASON, or HORSE-CLOTH, a sort of cover for a horse.

CAPAX, in the order of Malta, a name given to the knights that have resided five years at Malta, have made four caravans, or sea-campaigns, and are in a condition of coming to a command.

CAPE, in law, a judicial writ concerning plea of lands or tenements, and is divided into cape *magnum* and cape *parvum*, both of which affect things immoveable; and beſides theſe, there is a cape *ad valenciam*.

CAPE, in geography, a promontory, or head-land, which projects into the ſea farther than the reſt of the coaſt.

CAPE *Magnum*, or the grand cape, lies before appearance, to ſummon a tenant to anſwer the default, and alſo aver to the demandant.

The CAPE *Parvum*, is after appearance and view granted, and it ſummoneth the tenant to anſwer the default only.

CAPE *ad Valenciam*, is a ſpecies of cape *magnum*, where one being impleaded, and on a ſummons to warrant lands, a vouchee does not come at the day; whereupon, if the demandant recovers of the tenant, he ſhall have this writ againſt the vouchee, and recover ſo much in value of his lands, in caſe he hath ſo much; and if not, there ſhall be an execution of ſuch lands and tenements as ſhall after deſcend to him in fee; or if he purchaſes afterwards, there may be a re-ſummons, &c. againſt him.

CAPELET, a diſeaſe in horſes, when the tip of the hock is moveable, and more ſwelled than ordinary.

CAPELLA, in aſtronomy, a bright ſtar in the left ſhoulder of the conſtellation Auriga. For its place, &c. ſee the conſtellation AURIGA.

CAPER-BUSH, *Capparis*, in botany. See the article CAPPARIS.

Bean-CAPER. See ZYGOPHYLLUM.

The buds of this plant make a conſiderable article in commerce; they are imported from Italy and France in pickle, and uſed in ſauces, &c.

The caper-bark of the ſhops is not the bark of the branches, but that of the roots of the ſhrub which produces it.

It is an aperient and attenuant, and is recommended in nephritic caſes, and in dropſies, jaundices, and many other chronic diſeaſes: but the preſent practice does not pay any regard to it.

CAPHAR, a duty which the Turks raiſe on the Chriſtians, who carry or ſend merchandizes from Aleppo to Jeruſalem, and other places in Syria.

CAPI-AGA, or CAPOU-AGASSI, a Turkiſh officer, who is, as it were, grand-maſter of the ſeraglio.

CAPIAS, in law, a writ of two ſorts, one before judgment in an action, and the other after: that before judgment is called *capias ad reſpondendum*, where an original is ſued out, &c. to take the defendant, and make him anſwer the plaintiff; and that after judgment is the *capias ad ſatisfaciendum*, &c.

CAPIAS AD SATISFACIENDUM is a writ of execution that iſſues on a judgment obtained, and lies where any perſon recovers in a perſonal action, as for debt, damages, &c. in which caſes this writ iſſues to the ſheriff, commanding him to take the body of him againſt whom the debt is recovered, who is to be kept in priſon till he make ſatisfaction.

CAPIAS CONDUCTOS AD PROFICISCENDUM, an original writ which lies, by the common law, againſt any ſoldier who has covenanted to ſerve the king in war, and appears not at the time and place appointed. It is directed to two of the king's ſerjeants at arms, to arreſt and take him wherever he can be found, and to bring him *coram conſilio noſtro*, with a clauſe of aſſiſtance.

CAPIAS PRO FINE, is a writ lying where a perſon is fined to the king, for ſome offence committed againſt a ſtatute, and he does not diſcharge the fine according to the judgment; therefore his body ſhall be taken by this writ, and committed to gaol till the fine is paid.

CAPIAS UTLEGATUM, a writ which lies againſt any one outlawed, upon any action perſonal or criminal, by which the ſheriff is ordered to apprehend the party outlawed, for not appearing on the exigent, and keep him in ſafe cuſtody till the day of return, when he is to preſent him to the court, to be there farther ordered for his contempt.

CAPIAS IN WITHERNAM, a writ that lies for cattle *in Withernam*; that is, where a diſtreſs taken is driven out of the country; ſo that the ſheriff cannot make deliverance upon a replevin; then this writ iſſues, commanding the ſheriff to take as many beaſts of the diſtrainer.

CAPIGI, in the Turkiſh affairs, the name of certain inferior officers belonging to the ſeraglio, to the number of five hundred, whoſe buſineſs it is to aſſiſt the janizaries in guarding the firſt and ſecond gate of that palace; whence alſo the name capigi, which ſignifies a gate.

CAPILLAMENT, in a general ſenſe, ſignifies a hair, whence the word is applied to ſeveral things, which, on account of their length or their fineneſs, reſemble hairs: as,

CAPILLAMENTS *of the Nerves*, in anatomy, the fine fibres, or filaments, whereof the nerves are compoſed.

CAPILLARY, in a general ſenſe, an appellation given to things, on account of their extreme fineneſs, or reſembling hair.

CAPILLARY FILAMENTS, in botany, are the fine ſlender parts of the ſtamina, (conſpicuous in many flowers) like hairs, which ſupports the antheræ or apices.

CAPILLARY FRACTURE, a ſmall and almoſt inſenſible fracture of the ſkull. See FRACTURE.

CAPILLARY ORES, in minerology, the ſame with thoſe otherwiſe denominated arboreſcent, or ſtriated.

CAPILLARY PLANTS, are ſuch plants as have no

no main ſtem, but their leaves ariſe from the root, upon pedicles, and produce their ſeeds on the back of their leaves, as the fern, maiden-hair, &c.

CAPILLARY TUBES, in phyſics, are glaſs pipes, the diameter of whoſe bore is at moſt but about one-tenth of an inch; though any pipe, whoſe cavity does not exceed that magnitude, may be called a capillary tube. The phenomena of capillary tubes being ſuch as contradict a known law in hydroſtatics, viz. that a fluid riſes in a tube to the ſame height with the level of its ſource, and likewiſe of affinity with the aſcent of the ſap through the ſtems of plants, for the nouriſhment of their fruit, and with divers other operations of nature; it has been thought of no ſmall moment in philoſophy, to find out and eſtabliſh their true cauſe, which after numerous experiments, and ſeveral conjectures about it, is found to be no other than the attraction of coheſion, by which ſmall particles of matter mutually adhere together, and form large bodies. See ATTRACTION *of Coheſion*.

Mr. Hauksbee, after having made many experiments to account for the aſcent and ſuſpenſion of water in glaſs tubes, aſſigns the attraction of the concave ſurface, in which the liquor is ſuſpended to be the cauſe; but Dr. Jurin, in a paper read before the Royal Society, and printed in number 355 of the Philoſophical Tranſactions, denies the above to be the cauſe, which he demonſtrates thus: Since, in every capillary tube, the height to which water will ſpontaneouſly riſe, is reciprocally as the diameter of the tube, it follows, that the ſurface, containing the ſuſpended water in every tube, is always a given quantity: but the column of the water ſuſpended, is as the diameter of the tube. There, if the attraction of the containing ſurface be the cauſe of the water's ſuſpenſion, it will follow, that equal cauſes produces unequal effects, which is abſurd.

To this it may perhaps be objected, that in two tubes of unequal diameters, the circumſtances are different, and therefore the two cauſes, though they be equal in themſelves, may produce effects that are unequal. For the leſſer tube has not only a greater curvature, but thoſe parts of the water, which lie in the middle of the tube, are nearer to the attracting ſurface than in the wider. But from this, if any thing follows, it muſt be, that the narrower the tube, it will ſuſpend the greater quantity of water, which is contrary to experiment; for the columns ſuſpended are as the diameters. But as experiments are generally more ſatisfactory in things of this nature than mathematical reaſoning, it may not be amiſs to make uſe of the following.

The tube *c d* (Plate XXVIII, *fig.* 2.) is compoſed of two parts; in the wider of which the water will riſe ſpontaneouſly to the height of *b f*, but the narrower part, if it were of a ſufficient length, would raiſe the water to a height equal to *c d*. This tube being filled with water, and the wider end *c* immerſed in the ſtagnant water *a b*, the whole continues ſuſpended. But if the narrower end be immerſed, (as in *fig.* 3.) the water immediately ſubſides, and ſtands at laſt at the height *d g*, equal to *b f*. For which it is manifeſt, that the ſuſpenſion of the water, in the former part of this experiment, is not owing to the attraction of the containing ſurface; ſince, if that were true, this ſurface, being the ſame when the tube is inverted, would ſuſpend the water at the ſame height, which we think ſufficiently ſhews that Mr. Hauksbee's hypotheſis is falſe.

The real cauſe of this phenomenon, is the attraction of the periphery, or rather of the ſmall annular portion of the inſide of the tube, to which the upper ſurface of the water is contiguous, and coheres: for this is the only part of the tube from which the water muſt recede upon its ſubſiding, and conſequently the only one, which, by the force of its coheſion or attraction, oppoſes the deſcent of the water.

This likewiſe is a cauſe proportionable to the effect which it produces, ſince that periphery, and the column ſuſpended, are both in the ſame proportion as the diameter of the tube. Though from either of thoſe particulars it were eaſy to draw a juſt demonſtration, yet, to put the matter out of all doubt, it may be proper to confirm this aſſertion, as we have done the former, by actual experiment.

Let therefore *e d c* (Plate XXVIII, *fig.* 4.) be a tube, like that made uſe of in the former experiment, except that the narrower part is of a greater length, and let *a f* and *b g* be the heights to which the water would ſpontaneouſly riſe in the two tubes *e d* and *d c*. If this tube have its wider orifice *c* immerſed in the water *a b*, and be filled to any height leſs than the length of the wider part, the water will immediately ſubſide to a level with the point *g*; but if the ſurface of the contained water enter never ſo little within the ſmaller tube *e d*, the whole column *d c* will be ſuſpended, provided the length of that column do not exceed the height *a f*. In this experiment it is plain, that there is nothing to ſuſtain the water at ſo great a height, except the contact of the periphery of the leſſer tube, to which the upper ſurface of the water is contiguous; for the tube *d c*, by the ſuppoſition, is not able to ſupport the water at a greater height than *b g*.

When the ſame tube is inverted (as in *fig.* 5.) and the water is raiſed into the lower extremity of the wider tube *c d*, it immediately ſinks, if the length of the ſuſpended column *d b* be greater than *g b*; whereas, in the tube *d e*, it would be ſuſpended to the height *a f*; from which it manifeſtly appears, that the ſuſpenſion of the column *d b* does not depend on the attraction of the tube *d e*, but upon the periphery of the wider tube, with which its upper ſurface is in contact.

Though theſe experiments ſeem to be concluſive,

yet

yet it may not be improper to prevent an objection, which naturally presents itself, and which at first view may be thought sufficient to overturn the above theory. For since the periphery of the tube *e d* (*fig.* 4.) is able to sustain no more than a column of the length *a f*, contained in the same tube; how comes it to sustain a column of the same length in the wider tube *d c*, which is as much greater than the former, as the section of the wider tube exceeds that of the narrower? Again, if a periphery of the wider tube *d c* (*fig.* 5.) be able to sustain a column of water in the same tube of the length *b g*; why will it support no more than a column of the same length in the narrower tube *e d*? which queries may likewise be made with regard to *fig.* 1 and 2.

The answer is easy, for the moments of these two columns of water are precisely the same, as if the sustaining tubes *e d* and *c d* were continued down to the surface of the stagnant water *a b*; since the velocities of the water, where those columns grow wider or narrower, are to the velocities of the attracting peripheries, reciprocally, as the different sections of the columns.

CAPILLARY *Vessels*, in anatomy, are the smallest or extreme parts of the veins and arteries.

CAPILLITIUM *Veneris*, in philosophy, the fine threads often seen floating in the air during the autumn. See AIR-THREADS.

CAPILUS *Veneris*, in botany. See the article MAIDEN-HAIR.

CAPISTRUM, in surgery, the name of a bandage used in case of fractures of the jaw.

CAPITAL, in a general sense, implies the head, chief, or principal of a thing.

The word is formed from the Latin, *caput*, the head, source, or beginning.

CAPITAL, in geography, denotes the principal city of a kingdom, province, or state. See METROPOLIS.

CAPITAL, among merchants, &c. implies the sum of money which individuals advance to make up the common stock of a partnership when it is first formed. It is also used to signify the stock with which a merchant first begins trade on his own account. It likewise denotes the fund or stock of a trading company or corporation.

CAPITAL *Crime*, implies a crime which subjects the criminal to a capital punishment, or loss of life.

CAPITAL, in architecture, is the uppermost part of a column or pilaster, serving as the head or crowning, placed immediately over the shaft, and under the entablature.

The capital is the principal and essential part of an order of a column or pilaster, and is of a different form in different orders, becoming the distinguishing characteristic between them. Vitruvius tells us that Callimachus, an ingenious statuary of Athens, invented the first regular capital from the following accident. An Athenian old woman happening to place a basket, covered with a square tile, over the root of an acanthus, which grew on the grave of a young Corinthian lady, the plant shooting up the following spring, encompassed the basket all round, till, meeting with the tile, it curled back in a kind of scrolls. The above sculptor passing by, and observing it, executed a capital on this plan, representing the tile by the abacus, the leaves of the acanthus by the scrolls, and the basket by the body of the capital.

The Tuscan CAPITAL is the most simple and unadorned of all the rest; its members, or parts, are four only, viz. an abacus *a*; (Plate XXVIII, *fig.* 6.) an ovolo or quarter round *b*; a collarino or neck *c*; and an astragal *d*; the latter indeed properly belongs to the fust or shaft.

The character which distinguishes this capital from the Doric, &c. is, that the abacus is square and quite plain, having no ogee or other moulding; and that there are no annulets under the ovolo. Authors indeed vary a little with regard to the character of the Tuscan capital.

Vignola, for instance, gives the abacus a fillet instead of an ovolo: Vitruvius and Scamozzi add an astragal and fillet between the ovolo and neck: Serilo only a fillet; and Philander rounds the corners of the abacus.

In the Trajan column there is no neck, the astragal of the shaft being confounded with that of the capital.

The height of this capital is the same with that of the base, viz. one module, or semidiameter. Its projecture is equal to that of the bottom of the column, viz. five-eights of the module.

The Doric CAPITAL has three annulets, or little square members, underneath the ovolo, instead of the astragal in the Tuscan, besides the abacus, an ovolo and a neck, all which it has in common with the former; and a talon, cyma, or ogee, with a fillet over the abacus. See Plate XXVIII, *fig.* 7.

Authors are also divided with regard to the characters of this capital. Palladio, Vignola, &c. put roses under the corner of the abacus, and also on the neck of this capital.

Vitruvius makes the height of this capital equal to half the diameter of the column below; and this height being divided into three parts, the first goes to the neck, the second to the boultin, and the third to the uppermost part of the capital.

The Ionic CAPITAL is composed of three parts; an abacus, consisting of an ogee; under this a rind, which produces the volutes or scrolls, the most essential parts of this capital; and at the bottom an ovolo or quarter round. The astragal under the ovolo belongs to the shaft: the middle part is called the rind or bark, from its supposed resemblance to the bark of a tree, laid on a vase, whose brim is represented

Capelury Tubes.

Fig. 1. Cap.

Fig. 2.

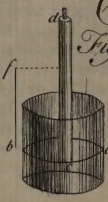


Fig. 3.

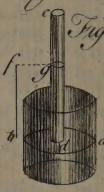


Fig. 4.

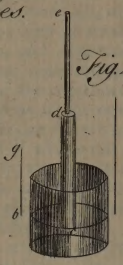


Fig. 5.

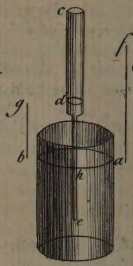


Fig. 6. Tuscan Capital.

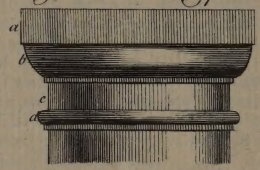


Fig. 7. Doric Capital.

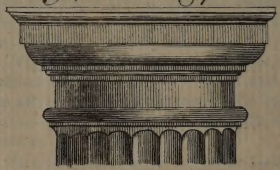
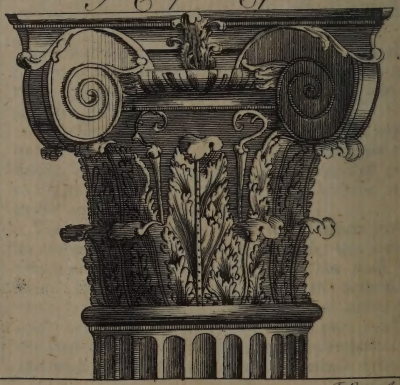


Fig. 8. Ancient Tonic Capital

Fig. 9. Modern Tonic Capital.

Fig. 10. Corinthian Capital.

Fig. 11. Composite Capital.



T. Cadge Sculp.

represented by the ovolo, and seeming to have been shrunk up in drying, and to have been twisted into the volutes. The ovolo is adorned with eggs, as they are sometimes called from their oval form. See Plate XXVIII. *fig.* 8.

The height of this capital, according to Mr. Perrault, is eighteen minutes, and its projecture one module, seven-tenths.

The differences in the character of this capital flow chiefly from the different management of the volutes, and consist in the following particulars: 1. That in the antique and some of the modern, the eye of the volute does not answer the astragal of the top of the shaft, as Vitruvius and some of the moderns make it. 2. That the face of the volutes, which usually makes a flat, is sometimes curved and convexed, so that the circumvolutions go advancing outwards, as is frequent in the antique. 3. That the border, or rim of the scroll in the volute, is sometimes not only a plain sweep, but the sweep is accompanied with a fillet. 4. That the leaves which invest the balluster are sometimes long and narrow, sometimes larger and broader. 5. That the two faces of the volutes are sometimes joined at the outward corner, the balluſters meeting in the middle, to form a regularity between the faces on the front and back of the building, with those of the sides. 6. That among the moderns, since Scamozzi, the Ionic capital has been altered, and the four faces made alike, by taking away the balluster, and hollowing all the faces of the volutes inwards, like the Compositе capital. 7. That Scamozzi and some others make the volutes to spring out of the ovolo, as from a base; whereas, in the antique, the bark passes between the ovolo and abacus quite straight, only twisting at its extremities to form the volute. And lastly, that of late the sculptors have added a kind of small festoons, which spring from the flower, whose stalk lies on the circumvolution of the volute. See *fig.* 9.

The Corinthian CAPITAL is the richest of all the orders, and imputed to Callimachus, an Athenian statuary, as we have already observed. It is adorned with eight volutes *a*, (Plate XXVIII. *fig.* 10.) a double row of leaves *b*, and eight scrolls *c*, situated round a body called, by some, campana or bell, and by others tambour or drum.

The height of this capital is two modules, and one-third, and its projecture one module, and one-third.

The differences in the characters of this capital are: 1. That in Vitruvius, and others, the leaves are those of the acanthus; whereas, in the antique, they are usually those of the olive-tree. 2. That the leaves are commonly unequal, the lower being made the taller; though sometimes all equal; nor are there instances wanting where the lower leaves are the shorter. 3. The leaves are sometimes ruffled, sometimes quite plain; the first row generally bellies out towards the bottom, but at other times they are straight. 4. Sometimes the horns of the abacus are sharp at the corner, but most commonly the corners are cut off. 5. There is some difference in the form and size of the rose. 6. The volutes are sometimes joined to each other, and sometimes wholly separated. 7. Sometimes the spires of the volutes continue twisting even to the end, in the same course; and sometimes they are turned back again near to the center, in the form of the letter S.

The Compositе CAPITAL is an invention of the Romans, and is composed of the double row of leaves in the Corinthian, and the volutes in the Ionic. See Plate Plate XXVIII. *fig.* 11.

The height of this capital is two modules, and one-third, and the projecture one module, and two-thirds.

The differences of its character consist in the following particulars: 1. That the volutes, which generally descend and touch the leaves, are in some works of the antique separated from them. 2. That the leaves are sometimes unequal in height, the lower row being the taller; and sometimes both are equal. 3. That the volutes of the moderns generally spring out of the base; whereas, in the antique, they run straight the whole length of the abacus, over the ovolo, without striking into the vase. 4. That the volutes, whose thickness is contracted in the middle, and enlarged both above and below in the antique, have their sides parallel in the works of the moderns. 5. That the volutes, which have generally been made as if solid both by the ancients and moderns, are now made much lighter and more airy; the folds standing hollow, and at a distance from one another.

Attic CAPITAL, that which has leaves of partition in the gorge.

Angular CAPITAL, that which supports the return of an entablature at the corner of the projecture of a frontispiece.

CAPITAL *of a Balluster*, that part which crowns a balluster, resembling sometimes the capital of some order, generally the Ionic.

CAPITAL *of a Triglyph*, the plat-band over the triglyph, called by Vitruvius tænia. It is sometimes a triglyph, and performs the office of a capital to the Doric pillaster.

CAPITAL *of a Nich*, a kind of small canopy made over a shallow nich, to cover a statue.

CAPITAL *of a Lantern*, a covering, sometimes of one form, and sometimes of another, which finishes the lantern of a dome.

CAPITAL *of a Bastion*, implies a line drawn from the point of the bastion to the angle of the polygon; or from the point of the bastion to the middle of the gorge.

CAPITALS, among printers, large or initial letters, with which all periods, verses, &c. commence.

CAPITATED PLANTS, in botany, a name given by Mr. Ray to thoſe plants, whoſe ſeeds, with their down, are included in a ſcaly calyx, or cup; of this ſort are the thiſtle, artichoke, and divers others.

CAPITATION, a tax or impoſition raiſed on each perſon, in conſideration of his labour, induſtry, office, rank, &c.

CAPITE, in law, an ancient tenure of land, held immediately of the king, as of his crown, either by knight's ſervice, or ſoccage. It is now aboliſhed.

CAPITOL, in antiquity, a celebrated caſtle erected on the ſummit of the Mons Capitolinus at Rome, and contained a temple dedicated to Jupiter, in which the ſenate formerly aſſembled. The nave of this ſtructure was ſacred to Jupiter, one of the wings to Juno, and the other to Minerva. In this beautiful edifice, which was richly adorned with ornaments, were contained the moſt ſacred depoſits of religion, ſuch as the ancylia, the books of the Sybils, &c.

CAPITOLINE *Games*, in antiquity, annual games, inſtituted by Camillus, in honour of Jupiter Capitolinus, and in commemoration of the Capitol's not being ſurpriſed by the Gauls.

There was alſo another kind of Capitoline games inſtituted by Domitian, when rewards and crowns were beſtowed on the poets, orators, hiſtorians, and muſicians. Theſe were celebrated every five years.

CAPITULA RURALIA, aſſemblies or chapters held by rural deans and parochial clergy, within the precinct of each deanry; held at firſt every three weeks, afterwards once a month, and more ſolemnly once a quarter.

CAPITULATION, in military affairs, a treaty made between the garriſon or inhabitants of a place beſieged, and the beſiegers, for delivering up the place on certain conditions expreſſed in the treaty.

CAPITULATION, in the German polity, implies a contract made by the emperor with the electors, in the name of all the princes and ſtates of the empire, before he is declared emperor, and which he ratifies before he is raiſed to the Imperial dignity.

CAPITULUM, among botaniſts, ſignifies the head or top of any flowering plant, and is the ſame as what is more commonly called umbel, which ſee.

CAPIVI, or COPAIBA. See BALSAM *of Copaiba*.

CAPOC, a ſort of cotton as ſoft as ſilk, but ſo fine and ſhort, that it cannot be ſpun. It grows in the Eaſt-Indies, and alſo near the river Guaiaquil in South-America, where it is uſed to fill beds, &c.

CAPON, a cock chicken, gelded as ſoon as left by the hen, or at leaſt as ſoon as he begins to crow.

CAPON's TAIL-GRASS, the ſame with feſtuca. See FESTUCA.

CAPONIERE, or CAPONNIERE, in fortification, a work ſunk about four or five feet deep, on the glacis of a place; the earth that is thrown out of it ſerves to form a parapet of two or three feet high, furniſhed with loop-holes, or ſmall embraſures; it is covered over head with ſtrong planks, on which are laid clays, or hurdles, to ſupport the earth, with which the whole is covered. It will contain about fifteen or twenty men, who fire through the loop-holes upon the beſiegers. Caponieres are ſometimes made in the bottom of a dry moat.

CAPPADINE, a ſort of ſilk flock taken from the upper part of the cocoon, after the ſilk is wound off.

CAPPANUS, a name given by ſome authors to the worm which adheres to and gnaws the bottom of a ſhip.

The cappanus is extremely pernicious to ſhips, particularly in the Eaſt and Weſt-Indies; to prevent this, ſeveral ſhips have lately been ſheathed with copper, particularly his Majeſty's ſhips, Alarm, Tartar, and Jaſon.

CAPPARIS, caper, in botany. See CAPER.

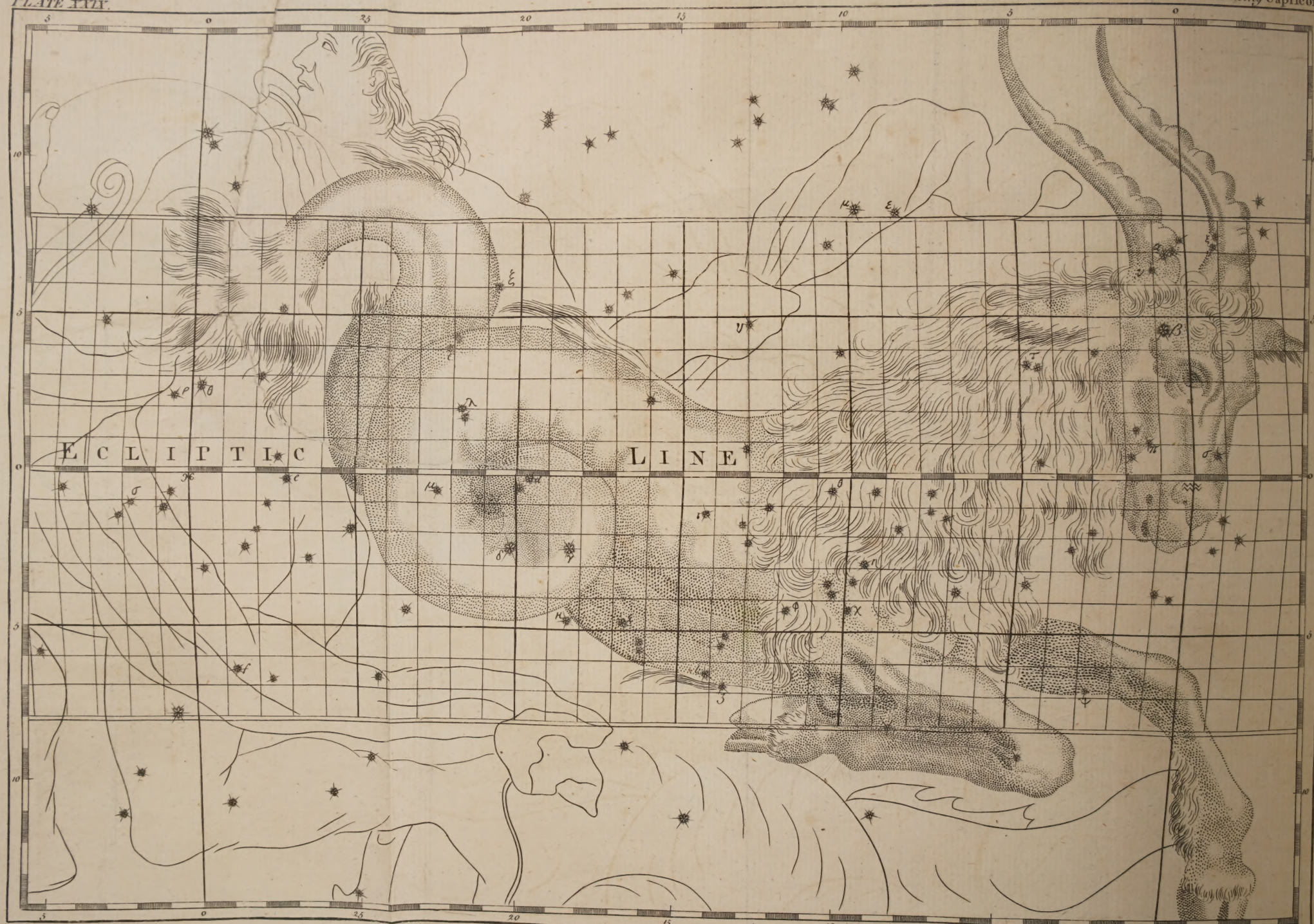
CAPPARIS, the caper-buſh, in botany, a polyandrious plant, whoſe characters are, it hath a large woody root, from whence proceed various ſtalks covered with a white bark, which ſends out many lateral branches, armed with hard ſharp ſpines, and on which the leaves are alternately diſpoſed: theſe are round, ſmooth, and entire. At the intermediate joints, between the branches, come out the flowers upon long foot-ſtalks: each of theſe conſiſts of four large, obtuſe, ſpreading petals, with numerous filiform filaments, topped with inclined oblong antheræ. The fruit is an unilocular fleſhy berry, and contains a number of kidney-ſhaped ſeeds. In Italy it grows wild among the ruins of old buildings, &c. but in other places it is cultivated.

What goes by the name of capers, (which are common as a pickle) are the buds of the flowers before they are opened, which are firſt laid in the ſhade for about four hours, and then put in vinegar for eight days; after which they are taken out, lightly preſſed, and put into freſh vinegar for eight days more: this is repeated the third time, and then they are put into caſks for ſale. They make a conſiderable article of commerce, and are uſed in ſauces, and are good to excite a languid appetite. The bark of the root is ſaid to be aperient and diſſolvent; but it is not much in uſe.

CAPRA, the goat, in zoology. See GOAT.

CAPRA-SALTANS, in meteorology, a fiery meteor or exhalation, ſometimes ſeen in the atmoſphere. It forms an inflected line, reſembling in ſome meaſure the caperings of a goat, whence it has its name.

CAPRARIA, in botany, a didynamious plant which grows naturally in ſeveral parts of America; the



CAPRICORN.

T. Lodge Sculp.

the ſtalk of which is angular and green, about a foot and a half high, ſending out branches at every joint. The leaves are placed round the branches by threes, with ſhort foot-ſtalks: theſe are oval, hairy, and ſlightly indented on their edges. The flowers are produced at the wings of the leaves; each of which conſiſts of a monopetalous campanulated corolla, cut at the top into five parts. The germen is conical, which afterwards becomes an oblong-conic capſule, compreſſed at the point, having two cells, containing a number of roundiſh ſeeds.

CAPREA, or CAPREOLUS, the roe-deer, in natural hiſtory, an animal of the deer-kind, with rounded, erect, and ramoſe horns.

CAPRICORNUS, or CAPRICORN, in aſtronomy, one of the twelve ſigns of the zodiac, repreſented on the globe in the form of a goat, with a fiſh's tail, as in Plate XXIX.

It is the tenth ſign in order, and is marked thus ♑. According to Ptolemy and Tycho, it contains nineteen ſtars, Hevilius twenty-nine, and Flamſtead fifty-one.

This conſtellation is very properly repreſented by the wild goat, whoſe nature being to ſeek its food from the bottom to the top of mountains, climbing from rock to rock, fitly emblemized the aſcent of the ſun, from the loweſt point, in the beginning of this ſign, to its higheſt pitch or ſummit, in the ſummer ſolſtice.

The poets tell us that this was Pan, the god of the ſhepherds, whom they feign in this manner. The gods having war with the giants, gathered themſelves together in Egypt. Typhon, the giant, purſued them thither, whereby the gods were brought into a quandary, that happy was he who, by changing his ſhape, might ſhift for himſelf. Jupiter turned himſelf into a ram, Apollo became a crow, Bacchus a goat, Diana a cat, Juno a cow, Venus a fiſh; but Pan, leaping into the river Nilus, turned the upper-part of his body into a goat, and the lower part into a fiſh. Jupiter, wondering at his ſtrange device, would have that image tranſlated into heaven, and made one of the twelve ſigns. The hinder-part of this ſign, being repreſented by a fiſh, is ſuppoſed to betoken, that when the ſun paſſes the latter part of this ſign, that it will be inclinable to rain. Others ſuppoſe, that this was the goat that ſuckled Jupiter, and that after it was dead, he made a ſhield of its ſkin, called Ægis, with which he ſingly combated the giants; after which he reſtored the goat to life again, and placed her in heaven among the conſtellations. This laſt ſuppoſition we think a little abſurd, for Capricorn is repreſented on the globe with the head of a he-goat, therefore Jupiter could with little probability be ſuckled by him, except the poets ſuppoſed he-goats to give milk in thoſe days.

Order.	Magn.	Name.	Bayer. Let.	Right Aſcenſion.	Diſtance from Nor. Pole.	Var. in Right Aſcen.	Var. in Declination.
				° ′ ″	° ′ ″	″	″
1	6			299.39.29	103. 5. 8	48.0	10.0
2	6		ξ	299.45.49	103.17.54	48.2	10.1
3	6			300 45.88	103. 4.45	48.0	10.2
4	6			300.58.21	112.31.45	51.0	10.3
5	4	1ma ad	α	301. 5.31	103.14.54	50.2	10.4
6	3	2da ad	α	301.11.16	103.16.13	50.2	10.4
7	obſ.		σ	301.23. 9	109.50.58	50.5	10.5
8	6		ν	301.57. 3	103.30.43	48.0	10.5
9	3		β	301.53. 8	105.31.18	50.3	10.6
10	obſ.		π	303.23.37	108.58.53	50.0	10.8
11	6		ρ	303.47.30	108.35.14	49.7	11.0
12	obſ.		ο	304. 1.30	109.21.23	50.0	11.5
13	6			305.58.19	106.57.16	49.0	11.8
14	6		τ	306.27.24	105.47.27	48.7	12.0
15	6		υ	306.35.25	108.57.39	49.5	12.3
16	5		ψ	307.57.10	116. 6.19	51.7	12.6
17	6			307. 3. 9	112.22.15	50.5	12.9
18	6		ω	309.20.32	117.47.42	52.5	13.0
19	6.7			311. 2. 9	108.49. 4	51.5	13.0
20	6.7			311.29.16	109.57. 1	49.2	13.4
21	6			311.50. 9	108.27. 1	49.0	13.6
22	5		η	312.42. 3	110.47.23	51.8	13.6
23	5		θ	313. 7.37	108.10.15	51.0	13.7
24	6		A	313.14.34	115.56.38	51.0	13.9
25	6	1ma ad	χ	313.41.31	112. 8.28	50.0	14.0
26	6	2da ad	χ	313.53.39	111. 8.41	49.0	14.2
27	6	3tia ad	χ	313.57. 7	111.29.59	49.7	14.3
28	6		φ	315.29.11	111.37.50	49.5	14.5
29	6			315.37. 8	106. 8.59	48.2	14.6
30	6			316. 7.15	108.58.34	49.0	14.7
31	7			316.12.18	108.27.29	48.7	14.8
32	5		ι	317.13.15	107.50.26	48.5	14.9
33	6			317.38.54	112.51.20	49.5	15.0
34	5		ξ	318.13.48	113.26. 3	52.0	15.0
35	6			318.24.33	112.12.38	49.5	15.1
36	6		b	318.44.54	112.49.52	49.7	15.2
37	6			320.20.20	111. 8.18	49.0	15.4
38	6			320.21.29	111.17.56	49.0	15.5
39	4		ε	320.54.45	110.31.36	50.9	15.6
40	4		γ	321.42. 2	108.43.44	50.2	15.7
41	6			322. 4.14	114.19.41	50.0	15.7
42	6	1ma ad	d	322. 7.27	105. 5.53	47.5	15.8
43	5		κ	322.18.43	109.56.46	48.7	15.8
44	6	2da ad	d	322.29.36	105.28.53	47.5	15.9
45	6			322.43.40	106.50.10	47.7	16.0
46	6	1ma ad	c	323. 2.26	100.10.36	46.2	16.0
47	6	2da ad	c	323.21.56	100.22.26	46.2	16.1
48	5		λ	323.23.29	102.27.40	47.0	16.1
49	3		δ	323.27.17	107.11.19	49.9	16.1
50	6			323.25.44	102.10.59	47.0	16.2
51	5		μ	325. 2.21	104.40.15	47.0	16.4

CAPRIFOLIUM, in botany, a name given by former authors to the honey-ſuckle; but comprehended under the lonicera of Linnæus. See the articles HONEY-SUCKLE and LONICERA.

CAPRIMULGUS, the goat-ſucker, in ornithology. See HIRUNDO.

CAPRIOLES, in the manege, imply the leaps made by a horſe in the ſame place, without advancing, in ſuch a manner, that when he is at the height of the leap, he jerks out his hinder legs.

CAPSICUM, Guinea pepper, in botany, a genus of pentandrious plants, the flower of which is monopetalous, and rotated with a ſhort tube, an open, plicated border, and divided into five broad and ſharp-pointed ſegments. The filaments are ſmall and ſubulated, topped with oblong antheræ, which are connected. The fruit, in ſome ſpecies, is a globular berry; in others heart-ſhaped, and in ſome irregular; but in all is ſoft and pulpy: it hath two or more cells, which contain a number of kidney-ſhaped compreſſed ſeeds. This genus contains ſeveral ſpecies, ſome of which are annual, and the others perennial. The annual ſorts are moſt of them raiſed on hot-beds in the ſpring, either for the ornament of the flower-garden, or for pickling when green; for which purpoſe they are very well adapted to thoſe palates that are fond of hot ſauces. One of the ſpecies, called in the Weſt-Indies bird-pepper, is the baſis of the powder brought from thence under the name of Cayan-pepper; and it may be remarked, that this fruit, perhaps the ſtrongeſt of the aromatic ſtimulants, is uſed freely by the natives of the warmer climates: poſſibly theſe pungent antiſeptic kinds of ſubſtances may be more ſalubrious there than with us, as they ſeem qualified to reſiſt or correct the putredinous colliquation of the humours which immoderate heat produces.

CAPSQUARES, in gunnery, ſtrong plates of iron, which come over the trunnions of a gun, to keep it faſt in the carriage.

They are faſtened by a hinge to the prize-plate, that they may lift up and down, and form an arch of a circle in the middle to receive a third part of the thickneſs of the trunnions, two-thirds being let into the carriage. The other end is faſtened with two iron wedges, called the forelocks and keys. At ſea, the capſquares are called clamps. See the article CLAMP.

CAPSTERN, or CAPSTAN, in naval architecture, a ſtrong, maſſy column of timber, let down through the decks of a ſhip, to raiſe any great purchaſe, by heaving round horizontally.

A capſtern is compoſed of ſeveral parts. See Plate XXX. *fig.* 1. and 2. where A is the main poſt, or body, *b* the whelps, *c* the drum-head, and *d* the ſpindle.

The whelps riſe out like buttreſſes from the main body of the capſtern, to enlarge the ſweep, that a greater portion of the cable may be drawn into the ſhip, or whatever rope they may be heaving on, at every revolution of the capſtern: they reach from the lower-part of the drum-head downwards to the deck, and are deſcribed in *fig.* 1. of Plate XXX. being the horizontal ſection of the body of a capſtern.

PLATE XXX. *fig.* 1, and 2.

The drum-head *c* is a broad cylindrical piece of wood, reſembling a mill-ſtone, of the ſame ſtock with the reſt of the body: in the outſide of this are cut a number of holes parallel to the deck, to receive the bars.

The ſpindle, which is ſhod with iron, is the axis or foot, which the capſtern reſts on, and turns round in the ſaucer, which is a ſort of iron ſocket, fixed on a wooden block or ſtandard, called the ſtep, reſting on the beams.

Beſides the different parts of the capſtern mentioned, it is furniſhed with ſeveral appurtenances, as the bars, the pins, the pawls, and ſwifter.

The bars are long pieces of wood or arms thruſt into a number of ſquare holes, cut into the drum-head all round: they appear like the radii of a circle, and are for heaving the capſtern round to draw the cable into the ſhip, or raiſe any great purchaſe; the men preſſing their breaſts to the bars, and walking about the capſtern till the operation is finiſhed.

The pins are little bolts of iron thruſt perpendicularly through the holes of the drum-head, when the bars are fixed, to prevent the bars from working out as the men heave; for this purpoſe there is a ſmall hole bored through the end of every bar to receive the pin: every pin is faſtened to the drum-head with a ſmall iron chain; and that the bars may exactly fit their reſpective holes, they are all numbered.

The pawls, which are on each ſide, are two ſhort, thick pieces of iron, bolted at one end through the deck to the beams, cloſe to the body of the capſtern; the other end, which occaſionally turns round on the deck, the pawls being placed in the intervals of the whelps, as the capſtern turns, prevents it from recoiling or turning back by any ſudden jerk of the cable as the ſhip pitches, which might greatly endanger the men who heave. And, laſtly,

The ſwifter, is a rope paſſed through the outer-ends of the bars, and drawn very tight: the intent of this is to keep the men ſteddy as they walk round, when the ſhip rocks, and to give room for a greater number to aſſiſt.

There are commonly two capſterns in a ſhip of war, the main and the jear capſtern; the former of which has two drum-heads, and may be called a double one. This is repreſented by *fig.* 1. of Plate XXX. the latter is exhibited in *fig.* 2.

Surge

Surge the CAPSTERN, is to ſlacken the rope heaved round, that it may ſlide farther upon the body of the capſtern, as it would otherwiſe, by a conſtant winding round the capſtern, get under the whelps, and prevent it from going round. There is generally about two turns and a half of the rope wound about the capſtern at once.

Heave the CAPSTERN, is to go round with it, heaving on the bars, and drawing on any rope which creates the purchaſe.

Come up the CAPSTERN, is to let go the rope on which they had been heaving.

CAPSULATE, or CAPSULATED PLANTS, thoſe furniſhed with capſules for the reception of their ſeed.

CAPSULE, in a general ſenſe, implies a ſmall receptacle or coffer, in the form of a bag.

The word is formed from the Latin, *capſula*, a diminutive of *copſa*, a coffer.

CAPSULE, among botaniſts, is a hollow pericarpium or ſeed-veſſel, which cleaves or parts in ſome determinate manner: it is compoſed of ſeveral elaſtic valves, which, when the ſeed is ripe, burſts open, and diſcharges its contents; and is diſtinguiſhed from a pod by its form in being ſhort and roundiſh.

This kind of pericarpium ſometimes contains one cell, or cavity, and ſometimes more: in the firſt caſe it is called an unilocular capſule; in the ſecond, bilocular, trilocular, &c. as it contains two, three, &c. cells or cavities.

CAPSULA-COMMUNIS, in anatomy, is a tunic continuous with the peritonæum, and includes the branches of the vena porta and biliary ducts, both as they approach the liver, and within it.

CAPSULA-CORDIS. See PERICARDIUM.

CAPSULÆ ATRABILIARIÆ, called alſo *glandulæ renales*, and *renes ſuccenturiati*, are two yellowiſh glands of a compreſſed figure, lying on each ſide of the upper-part of the kidneys. They have a very narrow cavity, imbued with a browniſh liquor of a ſweetiſh taſte. Their figure is irregular, between ſquare, triangular, and oval. Their ſize alſo is various; but in adults, they are in general about the bigneſs of a large nux vomica. In the fœtus they are larger, and often exceed the kidneys themſelves in ſize. The membrane that ſurrounds them is very thin; it cloſely involves their whole ſubſtance, and connects them with the kidneys. Their blood veſſels are ſometimes ſent from the aorta and the vena cava, but more frequently from the emulgents: their nerves are from the plexus renalis, and their lymphatic veſſels are numerous. There is no excretory duct diſcovered in them; and their uſe is therefore not certainly known. By their great ſize in the fœtus, they ſeem deſtined rather to the ſervice of that ſtate than of any other.

CAPSULÆ SEMINALES, the ſame with veſiculæ ſeminales. See VESICULÆ, &c.

CAPTAIN, a military officer, whereof there are various kinds, according to their different departments and commands.

CAPTAIN *of a Troop or Company*, an inferior officer, who commands a troop of horſe or company of foot under a colonel. In the ſame ſenſe, we ſay, captain of dragoons, of grenadiers, of marines, of invalids, &c.

In the horſe and foot guards, the captains have the rank of colonels.

CAPTAIN *General*, the officer who ſuperintends the military forces of a kingdom.

CAPTAIN *Lieutenant*, he, who with the rank of captain, but the pay of lieutenant, commands a troop or company in the name and place of ſome other perſon who is diſpenſed with on account of his quality from performing the functions of his poſt.

Thus the colonel, being uſually captain of the firſt company of his regiment; that company is commanded by his deputy, under the title of captain-lieutenant.

So in England, as well as in France, the king, queen, dauphin, princes, &c. have uſually the title of captains of the guards, gens d'armes, &c. the real duty of which offices is performed by captain-lieutenants.

CAPTAIN *Reformed*, one who, upon the reduction of the forces, has his commiſſion and company ſuppreſſed; yet is continued captain, either as ſecond to another, or without any poſt or command at all.

CAPTAIN *of Militia*, he who commands a company of the militia, or trained bands. See the article MILITIA.

CAPTAIN BASHAW, or CAPONDAN BASHAW, in the polity of the Turks, ſignifies the Turkiſh high-admiral. He poſſeſſes the third office of the empire, and is inveſted with the ſame power at ſea, that the vizier has on ſhore.

CAPTAIN *of a Ship of War*, the officer who commands a ſhip of the line of battle, or a frigate which carries twenty guns or above. He ranks with a colonel in the army.

The charge and command of a captain, or commander of one of his Majeſty's ſhips, is very great, various, and complicated, ſince he is not only anſwerable for any bad conduct in the military government, navigation, and equipment of the ſhip, but alſo for the ill management of his inferior officers, whoſe particular charges he is appointed to inſpect and controul.

When he is informed of the ſhip's condition, which he is commiſſioned to govern, he is ordered to attend her conſtantly, and accelerate the neceſſary preparations to fit her for ſea; indeed ſo ſtrict are the injunctions laid on him by the lord-high-

admiral, or commissioners of the admiralty, in these cases, that he is forbid to lie out of the ship from the day of his arrival aboard, till the day of his discharge, unless by particular leave from the Admiralty or his commander in chief.

He is ordered distinctly to survey all the military stores that are sent aboard, and to return whatever are found unfit for service; to use his utmost assiduity and constant application to procure his complement of men; and observe particularly to enter such men only as are fit for the necessary duty, that the government may be put, as little as possible, to unnecessary expence, and, when fully manned, to endeavour to keep the established number of men complete; in order to this he is ordered to muster them himself, if there be no clerk of the check or muster-master at the port. See those articles.

When employed in a cruising station, he is to keep the sea the full length of time required; but if he is compelled by inevitable necessity from any unforeseen accident to return to port sooner than the limited time, he is to make no unnecessary stay there: at this time he is to be very careful in the choice of a good anchoring situation, and to order the master, or other careful officers, to sound and discover the depths of water, and dangers of the coast.

He is to quarter the officers and men to the necessary places, according to their station and abilities, previous to any engagement; and to exercise them in the discipline of naval war, that they may be the more expert in the time of battle.

He is ordered particularly not to convert any of his Majesty's stores to private uses; nor are any stores to be transferred from their original design, but by the consent of his officers.

He is not to suffer the purser, by any means, to have more advantages, by the provisions of the people, than is consistent with honour, and the general rules of naval discipline.

And, lastly, he is ordered by the admiralty to shew a good example of honour and virtue to the officers and men, and to discountenance and suppress all dissolute, immoral, and disorderly practices; and also such as are contrary to the rules of discipline and obedience, and to correct those who are guilty of the same, according to the usage of the sea. See the article CHAPLAIN, to whom this duty is usually transmitted.

He is also instructed to carry no woman to sea, nor request any foreigners, who are officers or gentlemen, to serve in his ship, without orders from the Admiralty: to give timely notice to any merchant-ships, destined on the same road, when going to sea, and take them under his charge and protection, together with such as he meets at sea in his passage, at least as far as his way agrees with theirs. And at the time of his arrival in any port, or his return from abroad, he is to assemble his officers, and draw up a detail of the observations that have been made during the voyage; or the qualities of the ship, as to her trim, ballast, stowage, and manner of sailing, for the information and direction of those who may succeed in command: and this account is to be signed by himself and officers, and to be returned to the commissioner of the navy residing at the port where the ship is discharged.

CAPTION, in law, is where a commission is executed, and the commissioners subscribe their names to a certificate, declaring when and where the commission was executed. It relates chiefly to commissions, to take answers in chancery, and depositions of witnesses, and take fines of lands, &c.

CAPTIVE, a slave or person taken by the enemy in war, or by a pirate or corsair. See the articles SLAVE and PIRATE.

CAPTIVITY, a punishment which God inflicted upon the Israelites for their vices and infidelities. The first of these captivities is that of Egypt, from which Moses delivered them; after which are reckoned six during the government of the judges: but the greatest and most remarkable were those of Judah and Israel, which happened under the kings of each of these kingdoms. It is generally believed that the ten tribes of Israel never came back again after their dispersion; and Josephus and St. Jerom are of this opinion: nevertheless, when we examine the writings of the prophets, we find the return of Israel from captivity pointed out in a manner almost as clear as that of the tribes of Benjamin and Judah.

The captivities of Judah are generally reckoned four; the fourth and last of which fell in the year of the world 3416, under Zedekiah; and from this period begin the seventy years captivity, foretold by Jeremiah.

CAPTURE, signifies particularly prizes taken by privateers, in time of war, which are to be divided between the captors. See the article PRIZE.

CAPUT, the head, in anatomy. See HEAD.

CAPUT CONCUTIENTS, a muscle of the neck, otherwise called transversarius secundus. See TRANSVERSARIUS.

CAPUT DRACONIS, the dragon's-head, in astronomy, the ascending node of the moon. See the article NODE.

CAPUT DRACONIS is also a star of the first magnitude, in the head of the constellation draco. See the article DRACO.

CAPUT GALLINAGINIS, in anatomy, a kind of septum, or spongeous border at the extremities of the apertures of each of the vesiculæ seminales, serving to hinder the seed coming from one side, from rushing upon, and so stopping the discharge of the other.

Some will have its use to be, to prevent the impulse of the seed from dilating the orifices of the vesiculæ,

veſiculæ, and ſo oozing out, except when aſſiſted by the compreſſion of the ſurrounding parts, as in copulation; but this, according to others, is rather the office of a diſtinct caruncle, placed at each orifice, and acting as a valve.

CAPUT MORTUUM, in chemiſtry, that thick, dry matter, which remains after diſtillation of any thing, but eſpecially of minerals.

The caput mortuum, called alſo terra damnata, is found in form of a friable, porous matter, without taſte or ſmell: it is ranked among the chemical elements, and ſuppoſed to conſtitute the dry, fixed, earthy, and ſolid part of all bodies whatever. It is what the chemiſts call a paſſive element or principle, ſerving as the baſis or ſupport of the active ones.

CAR, or CARR. See the article CARR.

CARABE, or KARABE, in natural hiſtory, a name given to amber. See AMBER.

CARABINE, in military affairs, is a ſort of muſketoon, the barrel of which is rifled ſpirally from the breech to the mouth, ſo that when the ball which is forced into it is again driven out by the ſtrength of the powder, it is lengthened about the breadth of a finger, and marked with the riſle of the bore.

The barrel of the carabine is three feet long, and the piece is four feet long, including the ſtock; it has an iron rammer, and the bullet is firſt driven into the mouth of the piece with a ſhort iron pin, called a driver, ſtriking it on the end with a ſmall hammer made for that purpoſe.

The carabine has a much greater range than the fuſil, or muſket, becauſe the riſle of the barrel impedes the ball, which by that means makes the greater reſiſtance at the firſt inflammation of the powder, and giving time for the whole charge to take fire before it goes out of the bore, it is at length thrown out with a greater force than from the common muſket.

CARABINEERS, or CARABINIERS, regiments of light-horſe, carrying longer carabines than the reſt, and uſed ſometimes on foot.

CARACOL, in the manege, the half turn which a horſeman makes, either to the right or left.

In the army, the horſe always make a caracol after each diſcharge, in order to paſs to the rear of the ſquadron.

CARACOL, in architecture, denotes a ſtair-caſe in a helix or ſpiral form.

CARACT, CARAT, or CARRAT, the name of that weight which expreſſes the degree of fineneſs that gold is of.

The mint-maſter, or cuſtom, have fixed the purity of gold at twenty-four caracts; though it is not poſſible ſo to purify and refine the metal, but it will want ſtill about one fourth part of a caract in abſolute purity and perfection. The caract is divided into $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$, and $\frac{1}{32}$. Theſe degrees ſerve to diſtinguiſh the greater or leſſer quantity of alloy therein contained: for inſtance, gold of twenty-two caracts is that which has two parts of ſilver, or of any other metal, and twenty-two of fine gold.

CARACT is alſo a certain weight which goldſmiths and jewellers uſe wherewith to weigh precious ſtones and pearls.

This caract weighs four grains, but ſomething lighter than the grains of other weights. Each of theſe grains is ſubdivided into $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$, &c.

CARAGROUTH, in commerce, a ſilver coin of the empire, weighing nine drachms. It goes at Conſtantinople for one hundred and twenty aſpers. There are four ſorts of them, which are all equally current, and of the ſame value.

CARAITES, in the eccleſiaſtical hiſtory of the Jews, a religious ſect among that people, who adhere cloſely to the text and letter of the ſcriptures, rejecting the rabbinical interpretations, and the cabala. The Calaites paſs for the moſt learned of the Jewiſh doctors; they are chiefly to be met with in Poland, Muſcovy, and the Eaſt; they are but few in compariſon of the bulk of the Jews, who are of the party of the rabbins: the latter have ſo great an averſion for the Caraites, that they will have no alliance, nor even converſation with them: they treat them as baſtards; and if a Caraite would turn rabbiniſt, the other Jews would not receive him.

CARANNA, a concrete reſinous juice, exuding from a large tree, of which we have no particular account. It is brought from New Spain, and ſome other parts of America in little maſſes, rolled up in leaves of flags; externally of a dark browniſh colour, internally brown with a caſt of red, variegated with irregular white ſtreaks; ſomewhat ſoft and tenacious when it firſt comes over, but in keeping grows dry and friable.

Caranna has been chiefly employed as an ingredient in vulnerary balſams, corroborant and diſcutient plaiſters, and other external applications. It has very ſeldom been given internally, and is now, in this country, almoſt wholly in diſuſe.

CARAT, or CARACT. See the article CARACT.

CARAVAN, or CARAVANNE, in the Eaſt, ſignifies a company or aſſembly of travellers and pilgrims, and more particularly of merchants, who for their greater ſecurity, and in order to aſſiſt each other, march in a body through the deſarts, and other dangerous places, which are infeſted with Arabs, or robbers.

There is a chief, or aga, who commands the caravan, and is attended by a certain number of janizaries, or other militia, according to the countries from whence the caravans ſet out; which number of ſoldiers muſt be ſufficient to defend them, and conduct them with ſafety to the places for which

which they are designed, and on a day appointed. The caravan encamps every evening near such wells, or brooks, as their guides are acquainted with; and there is a strict discipline observed upon this occasion, as in armies in time of war. Their beasts of burden are most commonly camels, who are capable of undergoing a very great fatigue.

CARAVAN is also used for the voyages or campaigns which the knights of Malta are obliged to make at sea against the Turks and corsairs, that they may arrive at the commandments or dignities of the order.

The reason of their being thus called, is because the knights have often seized the caravans going from Alexandria to Constantinople.

CARAVANIER, a person who leads the camels, and other beasts of burden, who are commonly used in the caravans in the East.

CARAVANSERA, or KARAVANSERA, a place appointed for receiving and loading the caravans.

It is commonly a large square building, in the middle of which there is a very spacious court; and under the arches, or piazzas that surround it, there runs a bank, raised some feet above the ground, where the merchants, and those who travel with them in any capacity, take up their lodgings, as well as they can, the beasts of burden being tied to the foot of the bank. Over the gates that lead into the court, there are sometimes little rooms, which the keepers of the caravanseras let out at a very high price, to such as have a mind to be private.

These buildings are chiefly owing to the charity of the Mahometans: they are esteemed sacred dwellings, where it is not permitted to insult any person, or to pillage any of the effects that are deposited there.

CARAVANSERASKIER, the steward or keeper of a caravansera.

He keeps an account of all the merchandizes that are sold upon trust, and demands the payments of the sums due to the merchants for what has been sold in the caravansera, on the seller's paying two per cent.

CARAVAYAY, CARRAWAY, the English name of the carui of botanists. See the article CARUI.

CARAWAY, in botany. See the article CARUM.

CARBUNCLE, in natural history, a very elegant gem, whose colour is a deep red, with an admixture of scarlet.

This gem was known among the ancients by the name of anthrax. It is usually found pure and faultless, and is of the same degree of hardness with the sapphire: it is naturally of an angular figure; and is found adhering, by its base, to a heavy and ferrugineous stone of the emery kind: its usual size is near a quarter of an inch in length, and two thirds of that in diameter in its thickest parts: when held up against the sun it loses its deep tinge, and becomes exactly of the colour of a burning charcoal; whence the propriety of the name which the ancients gave it. It bears the fire unaltered, not parting with its colour, nor becoming at all the paler by it. It is only found in the East-Indies, so far as is yet known, and there but very rarely.

CARBUNCLE, or ANTHRAX, in surgery, an inflammation which arises, in time of the plague, with a vesicle or blister, almost like those produced by burning. This inflammation, for the most part, terminates in a sphacelus, and putrifies the subjacent parts down to the bone, they becoming as black as a coal. A carbuncle always breaks out very speedily, even in the space of an hour or two, attended with heat and pain: as soon as it is opened, it discharges a livid sanies, or sometimes a limpid water: it is black within, which is a sign that the sphacelus has seized the subjacent parts, and is making its progress; but the putrid flesh in those who recover suppurates, and parts from the sound. The size of these pestilential blisters is various, more or less; as is also their number in the patient; for there is no part of the body which they do not infest, and they generally appear in company with buboes. BUBOE.

Those carbuncles which arise in the face, neck, breast, or arm-pits, are observed to be of the worst kind; for they generally kill the patient. As to the internal treatment of carbuncles, the very same is to be observed in this case as has been recommended under the article *pestilential* BUBOES.

In the external treatment, some of the modern physicians use only scarification in this case, with very good success; others only open the eruptions with a pair of scissars, and having discharged the matter, they frequently wash the carbuncle with *sp. vin. camph.* or *sp. vin.* wherein has been digested a little theriaca: they afterwards apply a maturating cataplasm, which is to be continued till the carbuncle separates from the sound parts; then they cut it out all at once.

CARBUNCLE, in heraldry, a charge or bearing, consisting of eight radii, four whereof make a common cross, and the other four a saltier.

Some call these radii buttons, or staves, because round, and enriched with buttons, or pearled like pilgrims staves, and frequently tipped or terminated with flower-de-luces: others blazon them, royal sceptres, placed in saltier, pale and fasse.

CARCASE, in architecture, the shell or ribs of a house, containing the partitions, floors, and rafters, made by carpenters; or it is the timber-work, or as it were the skeleton, of a house, before it is lathed and plaistered; it is otherwise called the framing.

CARCASS, in military affairs, is a sort of cartouch for the mortar; its figure is that of a spheroid, lengthened at one end, and flatted at the other; it

is compoſed of two arches of a circle, or rather an oval, of iron, which interſect each other at right angles, and terminate in a kind of little iron pan, or diſh, which forms the flat end of the carcaſs, and is called its culot or breech.

The interior part of this carcaſs is filled with grenadoes, and piſtol barrels, charged with leaden balls, as alſo with pitch, and whole powder, and the whole afterwards covered with okum dipped in pitch, and ſacking, which laſt ſerves as a wrapper; a hole is made in this cloth, to put ſuch a fuſe through into the carcaſs, as is uſed in bombs, and the carcaſs is in the ſame manner diſcharged from a mortar.

It is ſaid carcaſſes were invented towards the year 1672, and uſed by the French in the wars between France and Holland.

The carcaſs weighs about twenty pounds, is twelve inches high, and ten inches diameter in the middle. The uſe of this carcaſs is to ſet fire to the places on which it is thrown. The various parts of its compoſition cannot fail of cauſing great diſorder where it falls; the pitch which is poured into it, ſo as to fill all the vacancies between the reſt of its contents, renders the fire tenacious, and the ſmall barrels it is charged with, and which do not go off all at one time, deter every one from coming near enough to extinguiſh it, and it is for that reaſon they are put in. But the uſe of this kind of fire-ball is notwithſtanding aboliſhed, if we may be allowed the expreſſion, becauſe it has been obſerved that its effect is very little ſuperior to that of a bomb, and that it is notwithſtanding attended with a much greater expence.

CARCINOMA, *καρκινωμα*, among phyſicians, the ſame with cancer. See the article CANCER.

CARDS, among gameſters, little pieces of fine thin paſteboard of an oblong figure, of ſeveral ſizes, but moſt commonly in England three inches and an half long, and two and an half broad, on which are painted ſeveral points and figures.

The moulds and blocks for making cards are exactly like thoſe that were uſed for the firſt books: they lay a ſheet of wet or moiſt paper on the block, which is firſt ſlightly done over with a ſort of ink made with lamp-black diluted in water, and mixed with ſome ſtarch to give it a body. They afterwards rub it off with a round liſt. The court-cards are coloured by means of ſeveral patterns, ſtiled ſtanefiles: theſe conſiſt of papers cut through with a pen-knife, and in theſe apertures they apply ſeverally, the various colours, as red, black, &c. Theſe patterns are painted with oil-colours, that the bruſhes may not wear them out; and when the pattern is laid on the paſteboard, they ſlightly paſs over it a bruſh full of colour, which, leaving it within the openings, forms the face or figure of the card.

CARD, among manufacturers, a ſort of inſtrument or comb, compoſed of a great number of ſmall pieces or teeth of iron wire, incurvated or bent, like a hook, near the middle, and faſtened very cloſely together by the baſes or feet in rows.

CARD-MAKING, the buſineſs of making cards for the manufacturers.

A piece of thick leather, of the ſize intended for the card, is ſtrained in a frame for that purpoſe, and then pricked full of holes, into which the teeth or pieces of iron wire are inſerted. After which the leather is nailed by the edges to a flat piece of wood, in the form of an oblong ſquare, about a foot in length, and half a foot in breadth, with a handle placed in the middle of one of the longer ſides.

The teeth are made in the following manner: The wire being drawn of the ſize intended, a ſkain, or number of wires, are cut into proper lengths, by means of a gauge; and then doubled in a tool contrived for that purpoſe. After which they are bent into the proper direction by means of another tool, and then placed in the leather, as mentioned above.

CARDAMINE, lady's ſmock, in botany, a genus of tetradynamious plants, producing cruciform flowers, each conſiſting of four oval, oblong, open petals, terminating in erect ungues. The fruit is a long compreſſed cylindrical pod, compoſed of two ſpiral valves, with two cells, containing a number of roundiſh ſeeds; the common ſort grows naturally in the meadows in many parts of England, which being eaten by way of ſallad in the ſpring, is ſuppoſed to be a good antiſcorbutic.

CARDAMOM, in the Materia Medica, a dried fruit or pod, brought from the Eaſt-Indies; divided internally into three cells, in each of which are contained two rows of triangular ſeeds, of a browniſh colour on the outſide and white within. They are diſtinguiſhed by the epithets *majus* and *minor*.

CARDAMOMUM *Minor*, the leſſer cardamom, has ſhort triangular huſks, ſcarce half an inch in length; the produce of a plant with reed-like ſtalks, and is deſcribed in the *Hortus Malabaricus*, under the name of elettari.

Theſe ſeeds, freed from the huſks, are an elegant and uſeful aromatic, of a grateful ſmell and flavour, very warm, yet not fiery, or ſubject, like the ſpices of the pepper kind, to produce immoderate heat. The huſks ſhould be ſeparated only at the time of uſe; for the ſeeds ſoon loſe a part of their flavour, in being kept without this defence.

Their virtue is extracted not only by rectified ſpirit, but almoſt completely by water alſo, with this difference, that the watery infuſion is cloudy or turbid, the ſpirituous clear and tranſparent; the colour of both is a pale yellow. Scarcely any of the aromatic ſeeds give out ſo much of their warmth to watery menſtrua, or abound ſo much with gummy matter, which appears to be the principle by

which the aromatic part is made diſſoluble in water: the infuſion is ſo mucilaginous, even in a dilute ſtate, as hardly to paſs through a filter.

In diſtillation with water, a conſiderable quantity of eſſential oil ſeparates from the watery fluid, of a pale yellowiſh colour, in ſmell exactly reſembling the cardamoms, and of a very pungent taſte: the remaining decoction is diſagreeably bitteriſh, and mucilaginous, retaining nothing of the pungency or warmth, any more than of the peculiar flavour of the ſpice. On inſpiſſating the tincture made in rectified ſpirit, a part of the flavour of the cardamoms ariſes with the ſpirit, but the greateſt part remains behind concentrated in the extract; which ſmells moderately of the ſeeds, and has a pungent aromatic taſte, very durable in the mouth, and rather more grateful than that of the ſeeds in ſubſtance.

Tinctures of this ſpice, both in rectified and proof ſpirit, are more agreeable than the watery infuſions; and proof ſpirit impregnated with its flavour by diſtillation, more agreeable than the ſimple diſtilled water. A tincture of ſix ounces of the ſeeds in a quart of proof ſpirit, and a ſpirituous water more lightly flavoured with them, by drawing off a gallon of proof ſpirit from four ounces, are kept in the ſhops, and occaſionally made uſe of as pleaſant warm cordials, and for flavouring other medicines. It is obſerved, that none of the aromatics anſwer, in general, ſo well as the tincture of this ſpice, for rendering mineral waters and other ſaline liquors acceptable to the ſtomach.

CARDAMOMUM *Majus*, the greater cardamom, called alſo grana Paradiſi, grains of Paradiſe. See GRANA *Paradiſi*.

CARDIAC, an appellation given to ſuch medicines as preſerve, or increaſe the ſtrength of the heart, and by that means the vital forces, though they do not immediately work upon the heart, nor are particularly appropriated to the corroboration of that part. This effect they perform either by repleniſhing the exhauſted veſſels with good humours, or exciting motion when it is required: therefore nutritives duly choſen, with reſpect to particular conſtitutions, belong to this claſs, as well as aſtringent corroboratives and ſtimulants. All the modern diſpenſatories are full of cardiacs or cordials, both of the dry and liquid kind; but the beſt are thoſe which remove the diſorder, of which lowneſs of ſpirits is the conſequence; and next to theſe is wine, which adminiſtered in proper quantities, and more or leſs diluted, as circumſtances require, will generally anſwer better purpoſes than more pompous cordials, whilſt it is leſs capable of doing miſchief.

CARDIACA, mother-wort, in botany, whoſe characters are; it hath a permanent root, from the head of which ariſes ſeveral ſtalks and leaves; the ſtalks are quadrangular, and of a reddiſh black colour, furniſhed with leaves, placed oppoſite in pairs at each joint on long foot-ſtalks; the leaves are venous and wrinkled, cut deeply into three ſharp-pointed indented ſegments; the lower ones are larger than thoſe on the ſtalks. The flower is labiated and monopetalous, with a narrow tube ſpreading at the brim; the upper lip is cylindrical, long, concave, hairy and obtuſe at the point; the lower lip is ſhorter, reflexed, and divided in three parts. The piſtillum ariſes from the calyx, attended with four embryoes, which afterwards become four oblong ſmooth ſeeds, incloſed in the empalement; it is found wild on the ſides of banks and in lanes in many parts of England.

It is ſaid to cure convulſions, open obſtructions of the viſcera, and to kill worms, and ſome account it excellent in diſeaſes of the ſpleen, and the hyſteric paſſion; the leaves and tops have a moderately ſtrong ſmell not very agreeable, and a very bitter taſte. The doſe of the leaves in powder is a dram, and muſt be taken in wine.

CARDIACUS PLEXUS, in anatomy, a plexus or piece of net-work, formed of a ramification of the par vagum, or eighth pair of nerves.

CARDIALGIA, in phyſic, a pain at the mouth of the ſtomach, or heart-burn.

The word is formed from καρδία, the heart, or rather the left orifice of the ſtomach, and ἄλγεω, to burn.

The cardialgia is none of the leaſt evils incident to mankind, but of the nature of thoſe diſorders which affect the mind as well as the body; nor is it a pain of the heart, as it is commonly reckoned, but of the ſtomach, which is a very nervous part, and of exquiſite ſenſation, and principally affects its orifices, being ſeated near the pit of the ſtomach, and very pungent, attended with great anxiety, difficulty of breathing, loſs of ſtrength, reſtleſſneſs, ſtrainings to vomit, trembling and coldneſs of the extreme parts, and a flight lipothymy, and owing its original to a convulſion or inflation, and frequently communicating its ill effects, by conſent of parts, to the whole nervous ſyſtem.

The curative intentions are, firſt to temper and correct the peccant matter lodged about the ſtomach, and to remove it by proper diſcutients, or proper evacuants. Secondly, to alleviate and ſoothe the violent pains, which ſurpriſingly impair the ſtrength, leſt an inflammation ſhould ſucceed. Thirdly, to have a due regard to the primary and original diſeaſe, if the diſorder be ſymptomatical. Fourthly, to reſtore and confirm the tone of the ſtomach and inteſtines, which have been weakened by the violence of the pains and ſpaſms, by proper remedies.

The heart-burn is uſually cauſed either by an alcaline or an acid acrimony prevailing in the ſtomach. If by a redundant acid, which is moſt generally the caſe, alcaline ſubſtances will cure the

preſent diſorder, as teſtaceous powders, or a clove chewed in the mouth, and ſwallowed gradually: but if the diſorder proceeds from an alcali, the cure will conſiſt in exhibiting aceſcent ſubſtances.

Galen recommends vinegar of ſquills, as a moſt effectual remedy for preventing the heart-burn: but Hippocrates, in the ſecond of his Epidemics, orders hot bread with pure wine, to be given in this diſorder. Perhaps the beſt medicine yet known for this diſeaſe, when it proceeds from an acid acrimony, is the magneſia alba.

CARDINAL, in a general ſenſe, an appellation given to things on account of their pre-eminence: thus we ſay, cardinal winds, cardinal virtues, &c.

CARDINAL FLOWER, in botany. See the article RAPUNTIUM.

CARDINAL VIRTUES, are theſe four, juſtice, prudence, temperance, and fortitude, upon which all the reſt depend.

CARDINAL POINTS, in coſmography, are the eaſt, weſt, north, and ſouth. See the article POINT.

CARDINAL WINDS, thoſe that blow from the cardinal points.

CARDINAL SIGNS, in the zodiac, are Aries, Libra, Cancer, and Capricorn.

CARDINAL, an eccleſiaſtical prince, in the Romiſh church, being one who has a voice in the conclave at the election of a pope.

The cardinals compoſe the pope's council, or ſenate; and there is, in the Vatican, a conſtitution of pope John, which declares, that as the pope repreſents Moſes, ſo the cardinals repreſent the ſeventy elders. It was pope Pius IV. who firſt decreed that the pope ſhould be choſen only by the college of cardinals; though ſome carry up this right as high as Nicolas II. in 1058. The cardinals began to wear the red-hat, at the council of Lyons, in 1243. Till the time of Urban VIII. they were ſtyled only Moſt Illuſtrious: afterwards, by a decree of that pope, they had the title of Eminence given them.

The cardinals are divided into ſix claſſes, or orders, conſiſting of ſix biſhops, fifty prieſts, and fourteen deacons, making in all ſeventy; which conſtitute what they call the ſacred college. The number of cardinal-biſhops has been always the ſame; but that of cardinal-prieſts and deacons is not fixed. Till the year 1125, the college conſiſted of fifty-two or fifty-three. The council of Conſtance reduced them to twenty-four, and Sixtus IV. raiſed them again to fifty-three. The ſix cardinal biſhops are thoſe of Oſtia, Porto, Sabina, Paleſtrina, Fraſcati, and Albano.

CARDING, the combing and preparing of wool, cotton, flax, &c. with the inſtruments called cards. See CARDS.

Before wool be carded, it muſt be greaſed with oil, of which one fourth part of the weight of the wool is required, for that which is deſigned for making the woof of ſtuffs, and the eighth part for that of the warp.

CARDIOID CURVE, in geometry, a curve firſt propoſed in the Mem. Acad. Scienc. 1705, by Monſieur Carré. It is formed thus: let the diameter AB, (Plate XXX. *fig.* 3.) of the circle AMBA, revolve about the point A, and AB produced; let B*a*MN, AD, MN, &c. be always equal to AB, then will the point *a* deſcribe a curve, which from its figure reſembling a heart, is called a cardioid.

From the conſtruction it appears that AN = BA + AM, and that NAN is always double the diameter AB, and is biſected by the circle in M.

If we put AB = *a*, *a*E = *x*, EN = *y*, the equation of the curve will be expreſſed algebraically thus, $y^4 - 6ay^3 + 12x^2y^2 - 6ax^3y + x^4 = 12a^2y^2 - 8a^3y + 3a^2x^2$.

For the method of drawing tangents and other properties of this curve, ſee Phil. Tranſ. N°. 461. Sect. 8.

CARDIOSPERMUM, in botany, a genus of octandrious plants, the flower of which conſiſts of four obtuſe petals, with eight awl-ſhaped filaments, topped with ſmall antheræ. The fruit is a roundiſh inflated trilocular capſule, with three lobes opening at the top, each cell having one or two round ſeeds marked with a heart. To this genus Linnæus has joined the corindum of Tournefort and veſicaria of Rivini.

CARDO, in anatomy, a name given to the ſecond vertebra of the neck.

CARDUUS, the thiſtle, in botany, a biennial plant, growing naturally in divers parts of England. This plant ſends forth many long leaves near the ground, which are compoſed of ſeveral long ſegments, placed by pairs, and are joined to a winged border, running on each ſide of the mid-rib. The whole length of theſe ſegments are alternately pointing upwards; the under ſide of the leaves, and the margin of the mid-rib, are armed with long ſharp ſpines ſtanding every way. The following ſpring there ariſes from the center of the plant one ſtrong channeled ſtalk four or five feet high, branching every way toward the top; the ſtalk and branches are garniſhed with the ſame ſhaped leaves as below, and each branch is terminated by a ſingle head of purple flowers; each of theſe are compound, and formed of many hermaphrodite florets, included in a common imbricated ventricoſe calyx; the florets are monopetalous and funnel-ſhaped, and contain five ſhort hairy ſtamina; the germen is oval, and afterwards becomes an oblong, four-cornered ſeed, crowned with down, and incloſed in the calx.

Another ſpecies of the carduus, called in Engliſh the lady's thiſtle, grows wild in many places, and has a long thick fibrous root, and long broad ſinu-

ated

ated leaves, crenated on their edges with many hard, ſhining, ſmooth, ſtiff prickles, of a light green colour, and variegated with lines or ſtripes of white. The ſtalks come out as the other ſort: theſe are ſtreaked and covered with a hairy down; the tender leaves, after the prickles are taken off, are eaten by ſome as a ſallad, and are ſaid to have the ſame virtues as the carduus benedictus; the ſeeds are excellent for the pleuriſy, rheumatiſm, and pains in the breaſt, and are given in emulſions.

CARDUUS *Benedictus*, holy thiſtle, a plant with rough, narrow, jagged leaves, terminating in ſoft prickles, and large, hairy, branched ſtalks, leaning to the ground; on the tops of which grow large, ſcaly, prickly heads, including a number of yellow floſculi, which are followed by oblong ſtriated ſeeds, incloſed in down. It is a native of Spain, and ſome of the iſlands of the Archipelago, and ſown annually with us in gardens. This plant is claſſed by Linnæus with the CNICUS, which ſee.

The virtues of this plant ſeem to be little attended to in the preſent practice. The nauſeous decoction is ſometimes uſed to excite vomiting, and a ſtrong infuſion to promote the operation of other emetics: but this elegant bitter, when extracted from the offenſive parts of the herb, may be advantageouſly applied to other purpoſes. We have frequently obſerved excellent effects from a light infuſion of carduus, in weakneſs of appetite and indigeſtion, where the ſtomach was injured by irregularities, and oppreſſed by viſcid phlegm: nor have we found any one medicine of the bitter kind to fit ſo eaſily on weak ſtomachs, or to heat ſo little. Theſe infuſions, taken freely, promote the natural ſecretions: drank warm in bed, they commonly increaſe perſpiration, or excite ſweat; and as they act with great mildneſs, not heating or irritating conſiderably, they have been uſed, in this intention, in acute as well as chronical diſeaſes.

CARDUUS FULLONUM, a name by which the dipſacus, or teazel, is ſometimes called. See the article DIPSACUS.

CAREENING, in naval affairs, heaving the ſhip down on one ſide by a ſtrong purchaſe applied to her maſts, which are properly ſupported for the occaſion, to prevent their breaking with ſo great a ſtrain.

Careening is uſed to heave the ſhip's ſide ſo low in the water, that her bottom being elevated above its ſurface on the other ſide, may be cleaned of any filth which adheres to it during a long voyage, as ſhells, ooze, ſea-weeds, &c.

This is performed by applying flaming faggots, furze, or other ſuch materials to the bilge; and the fire, thus catching on the tar, pitch, or other ſtuff, which had formerly been laid on the bottom to preſerve it, continues burning till all the excrement is looſened and falls off from the bottom; after this it is covered with a compoſition of tallow, ſulphur, turpentine, &c. and one ſide being cleaned in this manner, the other is heaved out for the ſame purpoſe. When a ſhip is laid on a careen, every thing is taken out of her: a ſhip is alſo ſaid to careen when ſhe lies down at ſea, as preſſed with a weight of ſail.

CARET, among grammarians, a character marked thus ʌ, ſignifying that ſomething is added on the margin, or interlined, which ought to have come in where the caret ſtands.

CAREX, in botany, a genus of plants: in the male flower there is no corolla; in the female there are no petals; but the nectarium is of an ovato-oblong form, inflated, bidentated at the top: there is no pericarpium; but the nectarium, growing large, contains a ſingle ovato-acute triquetrous ſeed, with one of its angles leſs than the reſt.

CARGO, in naval affairs, the merchant-goods whatever ſort with which a ſhip is freighted, and proceeds from port to port.

CARIA, in zoology, a ſpecies of ant, common in the Eaſt-Indies, and larger than thoſe with us.

They are very miſchievous, living in large communities, and throwing up hills of earth five or ſix feet high.

CARICA, in botany. See the article PAPAW.

CARIES, in ſurgery, is properly a diſorder in which the bone, from whatever cauſe, is deprived of its periofteum; and having loſt its natural heat and colour, becomes fatty, yellow, brown, and at length black; this is the firſt and lighteſt degree of the diſorder, and is what, according to Celſus, the ancients called *os vitiatum*, and the *nigrities oſſium*. But the greater degree of this diſorder is where the bone is eroded and eaten, and becomes uneven by reaſon of the number of ſmall holes, of which it is full, when it diſcharges a filthy ſanies, whoſe acrimony ſoftens, relaxes, and deſtroys the fleſhy parts that grow round it. This is a true caries or ulcer of the bone; and every bone of the body is ſubject to this diſorder: and though this ulcer may appear to be ever ſo ſafely or happily healed, yet it too often happens, that after the cicatrix is formed, and has been ſo for ſome time, a new abſceſs will be made, the whole diſorder will return afreſh, and the acrimonious and corrupted matter, which continually iſſues out from the various bones, being collected within, will produce many grievous ſymptoms, and deſtroy the neighbouring fleſh again.

Many methods have been attempted for the cure of a caries; the firſt and mildeſt is applied to the lighteſt degree of the diſeaſe, and is performed by the application of ſpirituous remedies, ſuch as ſpirit of wine, Hungary-water; or by ſlight balſamics, ſuch as the powder of birthwort, florentine iris, myrrh, or aloes. Either of theſe powders is to be ſprinkled on the part, after the ſanies has been carefully wiped away with dry lint, and this continued till the cure is perfected. In a caries that penetrates

trates somewhat deeper, ſtronger remedies take place, ſuch as powder of euphorbium, or its eſſence, made in well rectified ſpirit of wine; or oil of cloves, cinnamon, or guaiacum; either of theſe may be touched on with a pencil, or laid upon dry lint, and applied: ſome alſo uſe the corroſive medicines, the phagadenic water, and ſpirit of vitriol, or of ſulphur; and, in the place of theſe, a ſolution of quick-ſilver in aquafortis may be uſed with great ſucceſs. When by theſe means an exfoliation of the bone has been produced, the buſineſs is then to treat it with balſamics.

A ſecond method of cure for a greater degree of caries is perforating the bone with the trepan, and dreſſing the part afterwards, either with balſamics, or dry lint. By theſe means the exfoliation of the bone is forwarded, and new veſſels puſh themſelves through the foraminula, which, joining with the neighbouring fleſh, make a new covering for the bone.

The third method of cure is performed by the raſpatory, or chiſſel, taking off the corrupted or vitiated part of the bone, till all beneath appears white, or ruddy, and ſound: and the fourth, which is the moſt ancient, and the moſt ſpeedy and certain method, is by the actual cautery, burning down the moſt vitiated part of the bone. This method, however, is not neceſſary, except in great degrees of this diſorder; and in the performing it, great care muſt be taken not to injure the neighbouring ſoft parts. For this reaſon an aſſiſtant ſhould always draw back the lips of the wound both ways, while the operation is performed; and if the opening be not wide enough, it ſhould be previouſly opened and enlarged by ſponge tents, or widened by the knife, till the bone lies fair, when the part muſt be carefully wiped with dry lint, to cleaſe it from the ſanies; and if there be any fungous fleſh, that muſt be alſo removed.

One application of the cautery, when the diſorder is conſiderable, will ſeldom prove ſufficient; it uſually requires to be repeated ſeveral times, at proper intervals; and if the caries be of ſuch extent that one cautery will not cover it all over, the firſt muſt be applied to the middle, and the ſucceeding towards its edges. This operation is not attended with any great pain, if care be taken not to injure any of the adjacent ſoft parts; for the bones are in themſelves free from any ſenſe of pain. Where the cranium is the ſeat of this diſorder, the cautery is attended with great hazard, as it is alſo in a caries of the ribs, or ſternum, from the neighbourhood of parts of the utmoſt conſequence to life. The carpus and tarſus alſo will very badly admit of cauterizing, becauſe of the neighbourhood of the tendons and ligaments, which it is ſcarce poſſible to avoid injuring in the operation. After cauterizing the part, it is to be dreſſed with dry lint only; or if the patient complain of great heat in the part, the lint may dipped in ſpirit of wine before it is applied: afterwards balſamics are to be applied till the part exfoliate, and then, if the cure be perfect, the vacuity will ſoon be filled with new ſound fleſh. But if the bone remains bare, or the fleſh it is covered with be ſoft and ſpongy, and does not adhere ſufficiently to the ſubjacent bone, or where the bone remains diſcoloured; in either of theſe caſes the cure will not ſtand, but the diſorder will break out again, unleſs prevented. In theſe caſes therefore the work muſt be all done over again, the ſpongy fleſh removed, and the actual cautery again applied, otherwiſe the cure can never ſtand. *Heiſter's Surgery.*

CARINA properly ſignifies the keel of a ſhip. See the article KEEL.

CARINA, in architecture, a name given by the ancient Romans, to all buildings in the form of a ſhip, from carina, the keel of a ſhip, as we ſtill uſe the word nave for *navis*, a ſhip, the middle or principal vault of our churches, becauſe it has that figure.

CARINA, in anatomy, a term uſed for the fibrous rudiments or embryo of a chick, appearing in an incubated egg.

The carina conſiſts of the entire vertebræ, as they appear after ten or twelve days incubation.

CARINA, or keel, in botany, the loweſt petal of a papilionaceous flower, often bipartite, placed under the vexillum, and between the alæ, the lower part of which runs into a claw of the length of the calyx, and inſerted in the receptacle.

CARIOUS, ſomething partaking of the nature of a caries. See CARIES.

CARLINA, the Carline thiſtle, in botany, a genus of ſyngeneſious plants. The common ſort grows naturally upon ſterile ground in many parts of England; it hath long, narrow, with deep inciſures, and placed in a circle round the root. They are rough and prickly like the other thiſtles, and of a pale green colour. It hath a compound flower, conſiſting of many hermaphrodite funnel-ſhaped florets. The ſeeds are pappous and downy at top. The root is thick, fibrous, perforated with ſmall holes, reddiſh on the outſide and whitiſh within; the ſmell is ſtrong and fragrant, and the taſte very penetrating and aromatic; the other ſpecies grow in Italy and Germany, and flower in June. Its root is moſt in eſteem, and recommended for its alexipharmic qualities, in reſiſting infection, and expelling malignities; but the preſent medical practice takes little or no notice of it.

It is a native of the mountainous parts of Italy and Germany, from whence the dried roots are ſometimes brought to us. Theſe are about an inch thick, externally of a ruſty or reddiſh brown colour, internally of a pale yellowiſh or browniſh,

corroded as it were upon the ſurface, and perforated with ſmall holes, ſo as to appear, when cut, as if worm-eaten.

The roots of Carline thiſtle have a moderately ſtrong, not agreeable ſmell, and a weak, bitteriſh, ſubacrid, ſomewhat aromatic taſte. They are ſuppoſed to be diaphoretic, antihyſteric, and anthelmintic. They have been greatly eſteemed by foreign phyſicians, in acute malignant as well as in chronical diſeaſes; and given in ſubſtance from a ſcruple to a dram, and in infuſion from one to two drams and more.

CARLINE, or CAROLINE, a ſilver coin current in the Neapolitan dominions, and worth about four-pence of our money.

CARLINGS, in naval architecture, ſhort pieces of ſquare timber ranging fore and aft, or lengthwiſe, between the beams of a ſhip, into which they are ſcored.

CARMELITES, or WHITE-FRIARS, are an order of our Lady of Mount Carmel, making one of the four orders of mendicants. They pretend to derive their original from the prophets Elijah and Eliſha.

CARMINATIVES, in pharmacy, are medicines appropriated to expel wind.

A great many ſeem to be ſtrangers to this term, as it does not appear to carry in it any thing expreſſive of the medicinal efficacy of thoſe ſimples which paſs under its denomination. This term had certainly its riſe, when medicine was too much in the hands of thoſe jugglers, who, for want of true knowledge in their profeſſion, brought religion into their party; and what through their ignorance they were not able to do by rational preſcription, they pretended to effect by invocation and their intereſt with heaven: which cant being generally, for the ſurprize ſake, couched in ſome ſhort verſes; the word *carmen*, which ſignifies a verſe, was uſed alſo to mean an enchantment; which was frequently made uſe of to ſatisfy the people of the operation of a medicine they could not account for. And as thoſe medicines now under this name are of quick efficacy, and the conſequences thereof, in many inſtances, ſurpriſing; and the moſt violent pains, ſometimes ariſing from pent-up wind, immediately ceaſing upon its diſperſion; ſuch medicines as give relief, in this caſe, are more properly termed carminatives, as if they cured by inchantment.

How they expel wind may be conceived, when we conſider that all the parts of the body are perſpirable. Sanctorius, in his Medicina Statica, determines all we call wind in the bowels, to be ſuch perſpirable matter as makes its eſcape through the coats of the ſtomach and inteſtines. Between the ſeveral membranes likewiſe of the muſcular parts may ſuch matter break out, and lodge for ſome time. Now whatſoever will rarefy and render ſuch collections of vapour thinner, muſt conduce to their utter diſcharge out of the body; and conſequently remove thoſe uneaſineſſes which ariſe from their detention. And as all thoſe things that paſs under this denomination are warm, and conſiſt of very light ſubtile parts, it is eaſy to conceive how a mixture of ſuch particles may agitate and rarefy thoſe flatulencies, ſo as to facilitate their expulſion; eſpecially conſidering thoſe grateful ſenſations which ſuch medicines give to the fibres, which cannot but invigorate their tonic undulations ſo much, that by degrees the obſtructed wind is diſlodged, and at laſt quite expelled: but if the obſtruction be not great, the rarefaction of the wind, upon taking ſuch a medicine, is often ſo ſudden, and likewiſe its diſcharge, that it goes off like the exploſion of gunpowder.

All the things under this claſs being warm and diſcuſſive, are much uſed in the compoſition of cathartics, of the rougher ſort eſpecially: for the irritation occaſioned by thoſe would be ſcarce tolerable, without the mitigation of ſuch grateful ingredients. Many likewiſe of this ſortment are in the compoſition of diſcuſſive topics.

CARMINE, a beautiful crimſon colour, formed of the tinging ſubſtance of cochineal, brightened with aqua-fortis by a proceſs ſimilar to that uſed for dying ſcarlet in grain. It is of great advantage in painting, as well in water as varniſh, both on account of its beauty and ſtanding well; but it will not mix with oil ſo as to have the due effect in that kind of painting.

The compilers of the new French Encyclopedie have given two or three old recipes for the preparation of this colour; and afterwards recommended another, as preferable to them, taken from Kunckel, which on examination is only a proceſs for making bad lake of ſcarlet rags: but rather than inſert ſuch imperfect inſtruction for the making an article of great conſequence, as may delude thoſe who are earneſt in their purſuit of this art into a fruitleſs expence of time and money, we chooſe to be ſilent in this particular, inſtead of leading them into an error by groundleſs pretenſions to the contrary.

CARNATION, *Dianthus*, in botany, a plant whoſe flower conſiſts of five petals, whoſe ungues are longer than the calyx; the cup is a cylindraceous, tubuloſe, ſtriated, premanent, perianthium, cut at the mouth in five parts; the filaments are awl-ſhaped, and ten in number; theſe are the length of the calyx, topped with oval, oblong, compreſſed antheræ. The germen is oval, and ſupports two ſubulated ſtyles longer than the ſtamina, which are crowned with recurved acuminated ſtigma; the fruit is a cylindraceous capſule of one cell, which contains a number of compreſſed angular ſeeds. Theſe are the characters of the plain ſingle flowers, which among floriſts are deſpiſed, none being acceptable but thoſe which produce double flowers, and

and these are not noticed, except they have peculiar appearances to recommend them. The principal properties in a good carnation are as follow: 1. The stem of the flower should be strong and able to support the weight of the flower, without lopping down. 2. The petals (or leaves) of the flower should be large, broad, stiff, laying flat, without any indentures on their edges; arising from the extremity to the center regularly, so as to form the whole as nearly hemispherical as possible. 3. The pod should be cylindrical, neither too short nor too long, for if it is too short the extreme petals will fall down and much diminish the beauty of the flower, and if too long, the flower will be contracted, which is disagreeable to a curious eye: it is also esteemed a good property if the flower expands without the pod bursting, which it is very apt to do; to remedy which, see the article BLOWING a *Flower*.

4. The colours should be bright, equally striped, on a pure white ground, for if there is one petal single coloured, it is called run, (in the florists language) and despised. The florists class carnations into five orders; the first they call flakes, these are of two colours only, and the stripes are large, going quite through the leaves; the second are called bizars, these have flowers striped or variegated with three or four different colours; the third are called piquetees, these flowers should always have a white ground, and are spotted or pounced with different colours; the fourth are called painted ladies, having their petals of a red or purplish colour, striped and are white underneath; the fifth sort are called bursters; these, if managed properly, grow exceeding large, and makes a grand appearance; a kind of secondary pod arises in the middle, which should be carefully taken out when the flower is nearly expanded; this sort is not so much cultivated as formerly, the present taste being chiefly confined to (what the florists call) whole-blowing carnations. Of each of these orders there are numerous varieties, and principally of flakes and bizars, which are most esteemed. To enumerate the varieties of the chief flowers in any one of these orders, would be almost impossible, since every country produces new flowers every year from seeds; so that those flowers, which at their first blowing were greatly valued, are, when become common, little regarded, especially if they are defective in any one property: therefore where flowers are so liable to mutability, either from the fancy of the owner, or that better kinds are yearly produced from seeds, (which it may be remarked does not often happen) they always take place of older, or worse flowers, which are turned out to make room for them. These flowers are dignified with the greatest titles, such as emperors, kings, princes, dukes, dutchesses, earls, countesses, barons, with gentlemen and ladies out of number, which to enumerate (if it were possible) would require not a small folio. These flowers are propagated either from seeds (by which new flowers are obtained) or from layers, for the increase of those sorts which are worthy of preservation. The seeds should be collected from the best flowers, and sown in the spring in large pots, or boxes, on light, rich earth, and covered about a quarter of an inch with the same. These should be situated where they can receive the morning sun only, observing to water them when necessary. In about a month the plants will come up, which will be fit to transplant in July, taking, if possible, the advantage of moist weather, placing them about three inches distance, in beds of light, rich earth, and kept watered and shaded in sunshine weather, till they have got good rooting. Here they may continue till September, when every other one should be taken up and transplanted into other beds, in order to give room for the remainder; here they may remain till flowering, when the goodness of them may be determined, observing, if the winter proves severe, to cover them occasionally with mats, &c. When they begin to blow, all the single flowers, and those of one colour, should be pulled up, and none but those which are good should be reserved, which, to increase, may be layed down as soon as possible, which is in June or July, according to the condition of the shoots; the method of doing which, see the article LAYING.

Florists transplant the layers, when they have got strong roots, into pots, in the size of which at first planting they differ. Some plant them in the large pots they are designed to blow in; others in small pots, which they shift in the spring into larger. This last method appears the most eligible, for if they are in small pots they stand in less compass, and are more easily protected from the severity of the winter; but those who plant them in large ones, shelter them with pots, which are open at the top and made for the purpose, for the cutting winds do them the greatest injury. In these pots are generally placed two plants.

Another method of increasing this plant, is by what is called piping (among florists;) the operation is, to cut the shoots quite off through a joint, and sticking them in rich earth, under a glass air tight: with some this practice succeeds very well, but in general it is precarious; however, the plants raised this way commonly spindle higher than those raised by layers.

When carnations begin to spindle, they should be removed on a stage made for the purpose, which generally have cisterns of water round each post; this is necessary, in order to prevent insects, particularly ear-wigs, from getting to the flowers, which if they are suffered to do, will soon destroy them, there being a sweetness at the bottom of the petals which these vermin are very fond of.

Notwithstanding the most valuable flowers are planted

planted in pots, yet there are many planted in borders in the flower-garden, where they are some of its principal ornaments, during their continuance of flower when properly intermixed.

Spanish CARNATION, a name used in the West-Indies, for the poinciana of botanists. See the article POINCIANA.

CARNATION *Colour*, among painters, is understood of all the parts of a picture, in general, which represent flesh, or which are naked and without drapery.

CARNELIAN, sarda, in natural history, a precious stone, of which there are three kinds, distinguished by three colours, a red, a yellow, and a white. Authors have attributed medicinal virtues to this stone, meaning the red carnelian; this therefore is to be understood the sarda, or carnelian of the shops. It is very well known among us, and is found in roundish or oval masses, much like our common pebble; and is generally met with between an inch and two or three inches in diameter: it is of a fine, compact, and close texture; of a glossy surface; and, in the several specimens, is of all the degrees of red, from the palest flesh-colour to the deepest blood-red. It is generally free from spots, clouds, or variegations; but sometimes it is veined very beautifully with an extremely pale red, or with white; the veins forming concentric circles, or other less regular figures, about a nucleus, in the manner of those of agates.

The pieces of carnelian which are all of one colour, and perfectly free from veins, are those which our jewellers generally make use of for seals, though the variegated ones are much more beautiful. The carnelian is tolerably hard, and capable of a very good polish: it is not at all affected by acid menstruums; the fire divests it of a part of its colour, and leaves it of a pale red; and a strong and long continued heat will reduce it to a pale dirty grey.

The finest carnelians are those of the East-Indies; but there are very beautiful ones found in the rivers of Silesia and Bohemia; and we have some not despicable ones in England.

CARNIVAL, or CARNAVAL, a time of rejoicing, a season of mirth, observed with great solemnity by the Italians, particularly at Venice, holding from Twelfth-day till Lent.

CARNIVEROUS, an appellation given to animals which naturally feed on flesh, and thence called beasts or birds of prey.

The word is compounded of the Latin, *caro*, flesh, and *voro*, to devour.

CARNOSITY, a term sometimes used for an excrescence, or tubercle, in the urethra.

CARO MUSCULOSA QUADRATA, in anatomy, the same with the palmaris brevis. See the article PALMARIS.

CAROB-TREE, in botany. See the article CERATONICA.

CAROLOSTADIANS, in church history, an ancient branch of Lutherans, who denied the real presence in the eucharist. See the article EUCHARIST.

CAROLUS, an ancient English broad piece of gold, struck under Charles I. Its value has of late been at twenty-three shillings sterling, though at the time it was coined, it is said to have been rated at twenty shillings.

CAROLUS, a small copper coin, with a little silver mixed with it, struck under Charles VIII. of France.

The carolus was worth twelve deniers, when it ceased to be current.

Those which are still current in trade, in Lorrain, or in some neighbouring provinces, go under the name of French sols.

CAROTEEL, in commerce, an uncertain weight or quantity of goods: thus a caroteel of cloves is from four to five hundred weight; of currants, from five to nine; of mace, about three hundred; of nutmegs, from six to seven hundred and a half.

CAROTIDS, in anatomy, two arteries of the neck, which convey the blood from the aorta to the brain, one called the right carotid, and the other the left: they arise near each other, from the curvature of the aorta, and run upon each side of the arteria trachea, between it and the internal jugular vein, as big as the larynx, without any ramification; each of these is then ramified into two branches, one named internal, the other external. The internal carotid artery having passed the great canal of the apophysis petrosa of the os temporis, sends off a branch through the sphenoidical fissure, to the orbit of the eye, and soon afterwards another through the foramen opticum, by which it communicates with the external carotid. The external is the smallest; it runs between the external angle of the lower jaw, and the parotid gland; afterwards it ascends on the fore-side of the ear, and ends in the temples. All the ramifications of the carotids are covered by the pia mater, in the duplicature of which they are distributed, and form capillary, reticular textures, in great numbers; afterwards they are lost in the inner substance of the brain. See the article ARTERY.

CARUCAGE, or CARUAGE, a term in husbandry for the ploughing of ground, either ordinary, for grain, hemp, and flax; or extraordinary, for woad, dyers-weed, rape, &c.

CARP, in ichthyology, the English name of the cyprinus, with four cirri, or beards, and the third ray of the back-fins armed with small hooks.

CARPENTER, an artificer in wood, designed for the purposes of building.

Ship CARPENTER, an officer appointed to examine

ſmine into the condition of the ſhip's hull and maſts; and to keep the pumps in good order, which he is frequently ordered to examine: he is likewiſe to obſerve that the ſhips decks and ſides are well caulked, and whether any thing gives way. It is alſo his duty, in the time of battle, to watch up and down in the lower apartments of the ſhip, to ſtop any holes that may have been made by balls in the ſides, with ſhot-plugs: and likewiſe to fiſh, or otherwiſe ſecure the maſts and yards.

As the carpenter and boatſwain (who generally meſs together) are diſtinguiſhed, by their ſingular qualities, from the reſt of the ſea-officers in general, ſo are they from one another in particular: for at the ſame time that the latter is remarkable for a ſavage tone of voice, the former is equally characterized by a groveling inclination of his head, partly occaſioned by carrying every day at noon a large quantity of uſeful timber out of the king's yards, which he was dextrous enough to convert into ſmall pieces, and call his chips, and partly by not having been taught to dance till he was inſtructed by the ſea-ſchool-maſter; who likewiſe taught him the uſe of Gunter's-ſcale, ſince which time he has for ever diſtracted the boatſwain with talking about the ſquare and cube-roots.

The carpenter is generally poſſeſſed of a very crooked and perturbed ſpirit, owing certainly to having been peſtered with a variety of knotty impediments, which greatly incumbered him, and at length made his temper as ſower as the purſer's petty-warrant beer.

CARPENTRY, the art of cutting, framing, and joining large pieces of wood for the uſe of building. It is one of the arts ſubſervient to architecture, and is divided into houſe-carpentry and ſhip-carpentry: the firſt is employed in raiſing, roofing, flooring of houſes, &c. and the ſecond in the building of ſhips, &c. The rules in carpentry are much the ſame with thoſe of joinery; the only difference is, that carpentry is uſed in the larger coarſer work, and joinery in the ſmaller and curious. See JOINERY.

CARPET, a ſort of covering of ſtuff, or other materials, wrought with the needle or in a loom, forming part of the furniture of a houſe, and is commonly ſpread over tables, or laid upon the floor.

Perſian or Turky carpets are thoſe moſt eſteemed; though at Paris there is a manufactory after the manner of Perſia, where they make them little inferior, not to ſay finer, than the true Perſian carpets. They are velvety, and perfectly imitate the carpets which come from the Levant. There are alſo carpets of Germany, ſome of which are made of woollen ſtuffs, as ſerges, &c. and called ſquare carpets: others are made of wool alſo, but wrought with the needle, and often embelliſhed with ſilk; and laſtly, there are carpets made of dog's hair. We have likewiſe carpets made in England equal to any brought from the Eaſt.

CARPINUS, horn-beam, in botany. See the article HORNBEAM.

CARPOBALSAM, in the materia medica, the fruit of the tree which yields the true oriental balſam.

The carpobalſam is uſed in Egypt, according to Proſper Alpinus, in all the intentions for which the balſam itſelf is applied: but the only uſe the Europeans make of it is in Venice-treacle and mithridate, and in theſe not a great deal; for cubebs and juniper berries are generally ſubſtituted in its place.

CARPOCRATIANS, heretics who ſprung up towards the middle of the ſecond century, being a branch of the ancient Gnoſtics. They held a community of wives; and maintained, that a man cannot arrive at perfection without having paſſed through all criminal actions; laying down as a maxim, that there is no action bad in itſelf, but only from the opinion of men; accordingly they are charged with committing the moſt infamous at their love-feaſts. They attributed the creation of the world to angels; they ſaid that Jeſus was born in a manner like other men; they rejected the reſurrection of the body; and marked their diſciples at the bottom of the right ear with a hot iron, or with a razor.

CARPUS, the wriſt, in anatomy. See the article WRIST.

CARR, among the ancients, a kind of throne mounted on wheels, and uſed in triumphs and other ſolemn occaſions.

CARRAC, the name of the veſſels employed by the Portugueſe in the Eaſt-India and Braſilian trade; they are very large, and fitted for fighting as well as for burden.

CARRAT, or CARACT. See CARACT.

CARRIAGE, a mechanical vehicle for conveying, perſons, goods, or matter of what kind ſoever from one place to another.

Their conſtructions and forms are different, according to the purpoſe for which they are required. If for land-carriage, the machines chiefly uſed in Europe are coaches, chariots, calaſhes, berlins, waggons, with four wheels; chaiſes, carts, and drays, with two wheels, all drawn by oxen, horſes, mules, buffaloes, &c. But thoſe for water-carriage in general are ſhips, barks, boats, &c. For the nature and conſtruction of each, ſee their reſpective name.

Letter or Bill of CARRIAGE, a writing given to a carrier or the maſter of any carriage, containing the number and quality of the pieces, bales, &c. of merchandizes, which he is entruſted with, that he may demand the payment of the carriage, and that the perſon to whom they are addreſſed may ſee whether they are delivered in the ſame number, and in as good condition as they were given to the carrier.

CARRIAGE *of a cannon*, is a ſort of cart or dray, (ſee Plate XXVII. *fig.* 3.) compoſed of two

long

long pieces of wood, called sides, or cheeks, which are made in a bending form, so that, (Plate XXVII. *fig.* 4.) one end of them *b* rests on the ground, and the other *a* is supported by the axis or axle-tree of the wheels, from which it jets out about a foot. The cheeks are joined to each other by four pieces of wood, called cross-quarters or transoms; the first *a* is called the transom of the chace; the second *c* the transom of the bed; the third *d* the transom of the sight; and the fourth *g*, which fills all the space between those parts of the cheeks that rest on the ground, is called the transom of the lunet, or eye-hole. In the cheeks, between the part that is opposite to the transom of the chace, and that which is opposite to the axle-tree of the wheels of the carriage, are two semicircular notches, in which the trunnions of the cannon are placed; on the three first transoms *a c d* is placed a piece of wood of a proper thickness, on which the breech of the cannon rests; this plank is called the bed of the carriage.

When the cannon is to be carried into the field, or removed from one place to another, the limber (avaunt-train) or fore-carriage, is added to that part of the cheeks where the transom of the lunette is placed.

Besides the carriage now described, which is the most common, and called the wheel-carriage, there are fort-carriages, sea-carriages, and bastard-carriages, which have low solid wheels, that serve to move them on a rampart, or to and fro in other places of small extent.

CARRIAGE, in agriculture, a furrow for the conveyance of water to overflow and improve the ground. It is distinguished into two sorts; the main carriage, which should be made a convenient descent; and the lesser carriages, which should be shallow, and as many in number as possible.

CARROT, *Daucus*, in botany, a genus of pentandrious plants, producing umbelliferous flowers. The principal umbel hath an involucrum, which is polyphyllous and pinnated. The proper flowers consist each of five inflexed heart-shaped petals, and contain five capillary stamina. The germen supports two reflexed styles, topped with obtuse stigma, and becomes afterward a small roundish striated fruit, divided in two parts, each having a single seed, convex and furrowed on one side, and plain on the other.

The common manured carrot hath leaves divided into a number of narrow segments; and the root, which is fleshy, is so well known that it requires no description. This plant is propagated by seed, and delights in a warm, light, sandy soil, which should be pretty deep, and well worked, that the roots may more easily run down; for if they meet with any obstruction, they are very apt to grow forked, and shoot out lateral branches, especially where the ground is too much dunged the same year that the seeds are sown; therefore the properest land for carrots is ground that has been well dunged, and cropped at least a year before; (this is in respect to kitchen-gardens;) but where the soil is fresh and fitting for carrots, dunging is not necessary.

Carrots are sown at different times of the year, in order to be fit for use at various seasons: the first season is about Christmas, on warm borders, &c. The second is in February or March: this is designed for the principal crop. For a third or autumnal crop, June or July is the time: and at the end of August some may be sown, in order to stand the winter, by which method there may be produced early carrots in March following, before the spring sowing is fit to draw. Previous to sowing the seeds, they should be well rubbed in the hands, to prevent their adhering together, which they are apt to do by forked hairs on their borders: and at the time for sowing, a calm day should be chosen for the operation; for they being very light, it would be a difficulty to sow even, if the wind blew strong. When the seed is sown, they should be trod into the ground, and afterward raked smooth.

When the plants are come up, they should be hoed out singly, at the distance of four inches. This is absolutely necessary, as it not only destroys the weeds, but also gives the plants which are left good encouragement to grow.

The roots of carrots have been long cultivated in gardens for culinary uses; but has not till of late years been much cultivated in the fields for cattle; we shall therefore subjoin the following extract, from a pamphlet lately published by Mr. Robert Billing, farmer at Weasenham, in Norfolk, by desire of the society for the encouragement of arts, manufactures, and commerce at London.

Mr. Billing says, that the culture of carrots for the winter feed of cattle has been long practised in the eastern parts of Suffolk; but never in the county of Norfolk, where turnips has hitherto been preferred. The premium offered by the society of arts encouraged him to make trial of them in the latter county, and in 1763, he sowed thirty acres and a half in three fields; one of thirteen acres, one of half an acre, and one of seventeen acres. The piece of thirteen acres was a cold, loamy soil, shallow, and underneath it a loamy gravel; the half acre a mixed soil upon a moist clay; and the seventeen acres a light dry soil, newly improved with a marle, fourteen acres of which were a shallow black sand upon a kind of imperfect grit-stone, called in that county carr-stone.

Mr. Billing advises plowing the land for carrots early, before the winter begin, that the ground may have all the benefit of the frost for mellowing the soil, and fitting it in the spring for the reception of the seed. The ground for carrots, every body knows, cannot be made too fine.

He

He ſowed four pounds of ſeed upon an acre, in the ſame manner as turnip ſeed is ſowed, only paſſing it firſt through a fine chaff ſieve, to make it ſeparate.

He recommends late ſowing as a means of checking the weeds and leſſening the expence of hoeing; for as carrots lie long in the ground before coming up, the weeds are apt to get the better of them; but this ſeems to have little weight, the land being well cleaned, early ſowing, in March, is moſt undoubtedly the moſt proper ſeaſon; and every man's experience muſt direct him in the hoeing of them. He owns, that harrowing the weeds out, after the carrots come up, will not hurt the carrots.

Of the carrots on the thirteen acres, many, when dug up, meaſured two feet long, and from twelve to fourteen inches round, at the upper end. Theſe were ſown on wheat ſtubble, dunged the year before; the half acre was clover laye dunged for the carrots, and there they grew conſiderably bigger. This thirteen acres and a half produced two hundred and forty cart loads of carrots; and the ſeventeen acres about two hundred and ſeventy loads, in all five hundred and ten; equal in uſe and effect to near one thouſand loads of turnips, or three hundred loads of hay, as experience has evinced, by the various ways in which they have been tried.

The ſeaſon for drawing the carrots is a little after Michaelmas. Mr. Billing ſays, that the beſt way of drawing them is by a man with a four pronged fork, who breaks the ground about ſix inches deep, and a little boy follows him to pick them up; but this method being tedious in large plantations, he found it neceſſary to plow them up with a narrow-ſheared wheel plow, which going ſlow, turned them up without injury to the carrots; and the cattle, being put into the field, eat them up without waſte; the firſt plowing does not throw them all up: but thoſe thrown up by a ſecond and third plowing, are equally good with thoſe thrown up at firſt.

With this crop of carrots Mr. Billing fatted thirty-three neat beaſts, and forty-nine ſhearing weathers. At firſt, he gave the cattle with the carrots a mixture of cabbages, forty load of which grew on half an acre of arable. This forty load of cabbages he computes to be equal to eighteen loads of carrots; the cattle were fondeſt of theſe at firſt, but having gradually taken to eat the carrots, they ſoon preferred them. To the thirty-three neat beaſts, and forty-nine weathers, he allowed one load of turnips when his cabbages were ſpent, and three loads of carrots each day, and they fatted as faſt upon theſe as upon ſeven loads of turnips, as experience taught him. He computes the profits of this ſmall ſtock to be about one hundred and twenty pound.

He alſo fed ſixteen working horſes with theſe carrots, without hay or corn, during the winter, except when they carried corn to Brancaſter, at ſixteen miles diſtance, and to the team employed in this ſervice, he allowed only a buſhel of oats a day. Peaſe-ſtraw, chaff, and carrots yielded all their ordinary food. For the horſes, Mr. Billing had the carrots waſhed, their heads and tails chopped off, which ſerved the hogs, and ſometimes they had a cut or two beſides. The ſixteen horſes eat two loads of carrots a week, equal to more than a load of hay.

Mr. Billing has not given ſo exact an account, as might be wiſhed, of the manner of drawing his carrots, and feeding his cattle, though the omiſſion does not proceed from deſign, but inadvertency. It ſhould ſeem, that at firſt he pulled up his carrots, by a man and a boy, carried them to a feeding cloſe, and diſperſed them about for the cattle to pick up; but afterwards, finding perhaps, this way tedious, he made uſe of his plow, turned his cattle into the ſame field where the carrots grew, and left them to pick them up, dirty as they were, for their own ſubſiſtence. This ſeems to be implied, but here we are not told what quantity of ground he plowed up at a time; whether more than the cattle eat in a day; or whether thoſe the horſes eat were plowed up freſh, or whether he had any method of keeping them for future uſe after being dug or plowed up. It ſhould ſeem by ſome expreſſions indeed, that he ſuffered them to continue in the ground all the winter, as, he ſays, they were difficult to be dug up, during a hard froſt; but if carrots will keep without damage during the winter, it were eaſy to preſerve a quantity to provide againſt the rigour of froſts, or other accidents, by the following method: about the beginning of November, when the green leaves are decayed, they ſhould be dug up, and laid in ſand, in a dry place, where the froſt cannot come at them; and take them out from time to time occaſionally as they are wanted.

Some of the largeſt and ſtraighteſt roots may be reſerved for ſeed, which may be planted in the middle of February, at about a foot diſtance; and in Auguſt the ſeeds will be ripe, when they ſhould be cut, and kept in a dry place till wanted.

Botaniſts enumerate ſix other ſpecies of carrot; ſome of them are reſerved by the curious for the ſake of variety. The common wild carrot grows in many parts of England: the ſeeds of this ſort are uſed in medicine. It is eſteemed as a diuretic, and good againſt the ſtone and gravel: it is alſo uſeful in uterine and hyſteric diſorders.

Another ſort, called candy carrot, the ſeed of which is long and ſlender at both ends, ſwelling at the middle, of a pleaſant ſmell, and ſharp hot taſte. It grew originally in Candia, and other places in the Levant. The ſeeds only are uſed, being aperient and good in diſorders of the kidneys. It is likewiſe accounted a good alexipharmic, and proper againſt the bites of venomous creatures; whence it is an ingre-

ingredient in mithridate and Venice-treacle. This laſt is a ſpecies of the athamanta. See the article SPIGNEL.

CARROUSAL, a courſe of chariots and horſes, or a magnificent entertainment exhibited by princes on ſome public rejoicing. It conſiſts in a cavalcade of ſeveral gentlemen richly dreſſed and equipped, after the manner of ancient cavaliers, divided into ſquadrons, meeting in ſome public place, and practiſing juſts, tournaments, &c.

CART, a vehicle, mounted upon two wheels, drawn by one or more horſes, uſed for the carriage of various ſorts of heavy things. The word ſeems derived from the French *charrette*, which ſignifies the ſame; or rather the Latin *carreta*, a diminutive of *carrus*.

A cart differs from a wain in that the former is drawn by horſes, and has two ſides called trills or ſhafts; whereas the latter is drawn by oxen, and has a wain-cope.

Carts in London and Weſtminſter are not to carry more than twelve ſacks of meal, or one chaldron of coals, on pain of forfeiting one of the horſes. The wheels are to be of a certain thickneſs, without iron; and if any perſon ride in a cart, not having another to guide it, he ſhall forfeit ten ſhillings. The chief difficulty in conſtructing of wheel carriages, is properly fitting the wheels and axle, which ought to be done in ſuch a manner that the carriage may move with the leaſt power poſſible; but by the preſent conſtruction of many wheel carriages, one would imagine they intended their cattle to draw by the ears or tail, inſtead of the proper place. See WHEEL-CARRIAGES, and WAGGON.

CARTEL, in the marine, a ſhip provided in time of war to exchange the priſoners of any two hoſtile powers; alſo to carry any particular requeſt or propoſal from the one to the other: for this reaſon, ſhe is particularly commanded to carry no cargo or arms, only a ſingle gun for firing ſignals.

Our honeſt Americans, however, who have ſo ſorely grieved of late for paying a ſmall part of the great taxes of this country, although demanded for their own particular protection, made not only no ſcruple to diſobey and deſpiſe this regulation of cartels during the late war; but, on the contrary, gave continual ſupplies of proviſions to our enemies in the Weſt-Indies, and thereby recovered them and recruited their fallen ſpirits, at a time when they were gaſping under the weight of our arms. With ſo much addreſs, indeed, did theſe oppreſſed and unfortunate traders conduct this ſcheme, that ten or twelve cartels being laden at the ſame time with beef, pork, bread, flour, &c. ſailed together for the French iſlands, and, in order to evade the ſtrict examination of our ſhips of war, were provided with a guardian privateer, equipped by the ſame expert owners, to ſeize their own veſſels, and direct their courſe to the places of their firſt deſtination; but if they were examined by our ſhips of war, to an Engliſh port. But this clumſy trick did not long eſcape the vigilance of our naval-officers, who found that the fellows ſent abroad by way of commanders or prize-maſters were utterly ignorant, and incapable of piloting any ſhip; and of conſequence only ſent to elude their ſcrutiny.

The moſt bare-faced piece of effrontery however that was ever committed of this kind was the ſeizing an armed veſſel, fitted in Philadelphia, to take theſe illegal cartels. She was commanded by a gentleman, whom the majority of the merchants in that city joined to oppoſe and diſtreſs. They employed a crew of ruffians, who ſeized his veſſel openly in the moſt unwarranted and lawleſs manner, and brought her up in triumph to the town, when ſhe had only five men aboard: and ſo inveterate was their hatred to the commander, that he was obliged to leave the country precipitately, as being in danger of his life.

CARTEL ſignifies alſo a letter of defiance, or a challenge, to decide a controverſy, either in a tournament, or in a ſingle combat. See the article DUEL.

CARTESIAN *Philoſophy*, the ſyſtem of phyſics advanced by Des Cartes, and maintained by his diſciples the Carteſians.

M. Des Cartes, in order to account for the celeſtial appearances, ſuppoſes that the matter of the world was at firſt divided by the Almighty into innumerable little equal parts, each endued with an equal degree of motion, both about its own center, and ſeparately, in ſuch a manner, that this matter conſtituted a fluid. He alſo ſuppoſed, that ſeveral collections of this matter were endued with a motion about different points, as common centers; which points were placed at equal diſtances, in ſuch a manner, that the matter round them conſtituted different vortices, as he calls them. He farther ſuppoſed, that the firſt particles of matter became, by thoſe inteſtine motions, of a ſpherical figure, and conſequently compoſed globules of ſeveral magnitudes; and theſe he calls the matter of his ſecond element.

But the very ſmall particles which were rubbed off by the aforeſaid motions, from the firſt particles of matter, and driven violently many different ways, made up a new matter, which he calls his firſt element. And ſince there would be more of his firſt element than was ſufficient to fill the vacuities between the globules of the ſecond element, he ſuppoſes that the remaining part would be driven towards the centre, by the circular motion of theſe globules, which did, for that reaſon, recede from it: and this matter, being there amaſſed in a ſphere, would, in the centre of every vortex, produce a body like the ſun; which ſun being thus formed, and moving about its own axis, with the common matter of the vortex, would neceſſarily throw out ſome parts of its matter, through the vacuities of the globules of the ſecond element,

element, constituting the vortex; and this especially, at such places as are the farthest from its poles, receiving at the same time, by these poles, as much as it loses in its equatorial parts; and by this means it would be able to carry round with it those globules that are nearest with greater velocity, and those that are remote with less: so that those globules, which are nearest the centre of the sun, must be least; because, were they greater or equal, they would, by reason of their velocity, have a greater centrifugal force, and recede from the centre. And should it happen that any of these sun-like bodies in the centers of the several vortices should be so incrustated and weakened, as to be carried about the vortex of the true sun; should it happen to be of less solidity, or less motion, than the globules towards the extremity of the solar vortex, it would descend towards the sun, till it met with globules of the same solidity, and capable of the same degree of motion with itself; and being fixed there, it would for ever after be carried about by the motion of the vortex, without either approaching any nearer to, or receding farther from the sun; and so become a planet.

Supposing all this, we are next to imagine that our system was at first divided into several vortices, in the centre of each of which was a lucid spherical body; and that some of these, being gradually incrustated, were swallowed up by others, which were larger and more powerful, till at last they were all destroyed and swallowed up by the biggest solar vortex, except some few, which were thrown off in right-lines, from one vortex to another; and so became comets: and from hence it appears, that those planets which are nearest the sun, are less solid; and that is also Des Cartes's reason why we see always the same face of the moon; because the hemisphere, which is opposite to the sun and the earth, is somewhat more solid than the other; as also, because the matter of the first element, which makes up the body of the sun, moves with a greater velocity the parts of the vortex, and the bodies swimming in it, than those that are remoter: therefore those planets which are nearer to the sun, must finish their periods sooner than those which are more remote from him. And the reason why the planets revolve round their axis is, because, according to this hypothesis, they were lucid, sun-like, and revolving bodies before.

Yet, notwithstanding all this fine chimera, it is; 1. Certain, that a vortex, produced by the revolution of a sphere about its axis, must be propagated in infinitum, if nothing hinder it: and therefore, since there must be as many vortices as there are fixed stars, one vortex would certainly run into another, and every particle would be actuated by a motion compounded of that of all the central spheres; which is absurd, and contrary to that constancy, limitation, and uniformity, which is observed in the phænomena of the heavenly bodies.

2. Since the motion of the parts of the vortices nearest the centre is swifter than that of the more remote, they must press upon the exterior parts, and thereby perpetually impart something of their motion to them; and therefore those exterior parts of the vortex will be continually lessening some part of their motion, which being never restored, these parts must still move slower and slower, till at last all the motion will be quite destroyed.

3. According to this hypothesis, each planet is of the same density with the parts of the vortex in which it swims, being governed by the same laws of motion, and is, as it were, only some concreted parts of the vortex. But the times of the periodical motion of bodies, carried round by a vortex, are in a duplicate ratio of their distances from their centre; as Sir Isaac Newton hath demonstrated in Sect. IX. of his Principia. Whereas the squares of the times of the periodical revolutions of the planets are as the cubes of their mean distance from the centre, or from the sun: wherefore the planets cannot be carried round by a vortex.

4. If a vortex run out in infinitum, then would a body carried round by it certainly describe a perfect circle, unless something solid hindered it; and therefore the greater the distance between those solid bounds, or the larger the bason be which contains the vortex, in respect of the orbit of the body carried round in it, the nearer would this orbit be to a circle; that is, the excentricity of the planets nearest the sun would be less than that of those which are more remote. Whereas the direct contrary to this is true in fact, the excentricity of Mercury being greater than that of Saturn.

5. A body, carried round in a vortex of the same density with it, would necessarily describe a circle, to whose plane the axis of the central body, producing the circulation of the fluid, would be perpendicular: and yet there is not one planet to the plane of whose orbit the sun's axis is perpendicular.

6. The comets have their orbits, not only oblique to, but sometimes at right angles with, the plane of the ecliptic; sometimes the course of these comets is diametrically opposite to that of the sun: they persevere in their motion, without any change. By lines drawn from them to the sun, they describe equal areas in equal times; and sometimes they enter into the vortex of the sun. All which would be impossible, if the solar vortex moved round forcibly enough to carry these vast bodies of the planet along with it.

CARTHAMUS, bastard saffron, in botany, a genus of plants whose flower is composed of several hermaphrodite florets, each of which are monopetalous, and funnel-shaped; and contain five short capillary filaments, topped with cylindrical, tubulose antheræ: it is destitute of a pericarpium; but the calyx incloses a single, oblong, angular seed.

There are several species of carthamus; but the

der the name of antophyllus, is marked on the top with the remains of the flower; it about the size and shape of an olive, and contains, under a thin blackish shell, a hard kernel of the same colour, which has a deep longitudinal seam on one side. The cloves are said to be cured by exposing them to smoke, and afterwards drying them in the sun.

The clove has a strong agreeable smell, and a bitterish, hot, very pungent taste: it is one of the hottest and most acrid of the substances of the aromatic class, and as such is often used, not only internally, but as an external stimulant. The antophyllus has the same kind of flavour with the clove itself; but being far weaker in smell as well as in taste, it is very rarely applied to any medicinal purposes, and is now scarcely ever to be met with in the shops.

The clove is remarkably disposed to imbibe humidity; and when robbed of its active parts, by infusion in menstrua or distillation, and afterwards mixed with fresh cloves, it regains from them a considerable share both of taste and smell. The Dutch, through whose hands this spice is brought to us, have often practised this abuse; which, however, may be easily discovered; for those cloves which have once lost their virtue, continue always not only weaker than the rest, but likewise of a much paler colour.

Tinctures of cloves in rectified spirit, are of a dark reddish brown colour, of no great smell, but of a highly acrid taste: if the quantity of spirit be considerable, it leaves the clove deprived of all its virtue. On inspissating the filtered tincture, the spirit which distils, is found to have very little impregnation from the spice: the remaining extract, nevertheless, does not discover so much smell as the clove in substance, but its taste is excessively pungent and fiery. The quantity of this burning extract amounts to about one-third the weight of the clove.

Digested or infused in water, they impregnate the liquor more strongly with their smell than they do spirit, but not near so much with their taste: after repeated infusion in water, they impart still a considerable tincture to rectified spirit. In distillation with water, they give over, very slowly, near one-sixth their weight of essential oil; when carefully distilled, colourless; by age, changing to a yellow, and at length to a reddish brown colour; when drawn with a strong fire, proving often of this colour at first; smelling strongly of the cloves; but in taste only moderately pungent, much less so than the spirituous extract. Neither the remaining clove nor decoction have any considerable taste; the pungency of this spice seeming to depend, not on the volatile or fixed parts separately, but on the combination of the two.

CARYOPHYLLUS *Ruber*, the clove July-flower, or gilli-flower, in botany, is the name of a plant with many smooth, round, jointed-stalks, and gramineous leaves of a bluish-green colour, standing in pairs at the joints: the flower is composed of five petals, narrow at the bases, broad and jagged at the top, set in an oblong cylindrical cup, which is covered at the bottom with four short scales, forming as it were a secondary cup: after the flower has fallen, the calyx becomes a covering to a number of small, flat, wrinkled, black seeds. It is perennial, and said to have been a native of Italy.

Several varieties of these flowers are cultivated in gardens; but the sort principally used in medicine are of a deep crimson colour, and of a pleasant aromatic smell, somewhat resembling that of the clove described in the preceding article. They are chiefly valued for the fine smell, which is readily extracted by infusion in water, and dissipated even by light coction. Three pounds of the fresh flowers, clipped from their heels, communicate, by infusion in a close vessel for a night, a grateful and moderately strong smell, and a deep red colour, to eight or nine pints of water; which, with a proper quantity of fine sugar, forms a very agreeable syrup.

On distilling the fresh flowers with water, the distilled liquor proves considerably impregnated with their fragrance. Rectified spirit, digested on the flowers, receives a much paler tincture than the watery liquors, but extracts the whole of their active matter. In distillation the spirit elevates much less than the water.

CARYOTA, in botany, a genus of plants; the male and female flowers of which are produced in separate parts of the same spadix; the corolla is divided into three hollow, lanceolated segments; the stamina are numerous filaments, longer than the corolla; the antheræ are linear; the corolla in the female flower is divided into two very small acuminated segments; the fruit is a round berry, containing a single cell; the seeds are two, large, oblong, rounded on one side, and flatted on the other.

CASCABLE, the knob or button at the end of the breech of a cannon. See the article CANNON.

CASCADE, a steep fall of water from a higher into a lower place.

CASCANS, in fortification, holes in form of wells, serving as entries to galleries to give vent to the enemies mines.

CASCARILLA, or ELEUTHERIA. See the article ELEUTHERIA.

CASE, *Casus*, among grammarians, implies the different inflexions or terminations of nouns, serving to express the different relations they bear to each other, and to the things they represent.

There is great diversity among grammarians, with regard to the nature and number of cases; they generally find six, even in most of the modern lan-

languages, which they call the nominative, genitive, dative, accuſative, vocative, and ablative; but this ſeems in compliance with their own ideas of the Greek and Latin, which they transfer to their own languages. The termination is not the ſole criterion of a caſe; for though ſome authors reckon five caſes of nouns in the Greek, and ſix in the Latin, yet ſeveral of theſe caſes are frequently alike: as the genitive and dative ſingular of the firſt and fifth declenſions of the Latin; the dative and ablative plural of all the declenſions, &c. the genitive and dative dual of the Greek, &c.

The Engliſh and many other modern languages expreſs the various relations, not by changes in the terminations, as the ancients, but by the appoſition of articles; it is certainly wrong to ſay, that *of a father* is the genitive caſe of *father*, and *to a father* the dative; for *of* and *to* are no part of the word *father*, they are only articles or modifications, which ſhew the different relation of the word *father*.

CASE, among printers, denotes a ſloping frame, divided into ſeveral compartments, containing a number of types or letters of the ſame kind.

From theſe compartments the compoſitor takes out each letter as he wants it, to compoſe a page or form. Thus they ſay a caſe of Pica, of Greek, &c.

CASE-HARDENING, a method of preparing iron, ſo as to render its outer ſurface hard, and capable of reſiſting any edged tool.

This is a leſſer degree of ſteel-making, and is practiſed by baking, calcination, or cementation in an oven, or other cloſe veſſel, ſtratified with charcoal and powdered hoofs and horns of animals, ſo as to exclude the air. See STEEL.

CASE-SHOT, in the military art, muſket-ball, ſtones, old iron, &c. put into caſes, and ſhot out of great guns.

CASEMATE, or CAZEMATE, in fortification. See the article CAZEMATE.

CASEMENT, or CASEMATE, in architecture, a hollow moulding, which ſome architects make one-ſixth of a circle, and others one-fourth.

Caſement is likewiſe the name of that part of the window hung with hinges, and which opens in the ſame manner as a door, before the invention of ſaſhes, and ſtill to be found in moſt antique buildings.

CASERN, in fortification, lodgings built in garriſon-towns, generally near the rampart, or in the waſte places of the town, for lodging the ſoldiers of the garriſon.

There are uſually two beds in each caſern for ſix ſoldiers to lie, who mount the guard alternately; the third part being always on duty.

CASES RESERVED, in the polity of the Roman church, atrocious crimes, the abſolution of which is reſerved by the ſuperiors to themſelves or their vicars.

CASH, in the commercial ſtyle, denotes the ſtock of money any merchant, trader, or banker has at his diſpoſal, in order to trade.

CASH-BOOK. See the article BOOK-KEEPING.

CASHEW-NUT, in botany. See the article ANACARDIUM.

CASHIER, a perſon who is entruſted with the caſh of ſome public company. See the articles CASH and COMPANY.

CASIA, in botany, the ſame with oſyris. See OSYRIS.

CASING *of Timber-work*, is plaiſtering a houſe all over on the outſide with mortar, and then ſtriking it while wet by a ruler with the corner of a trowel, or the like, to make it reſemble the joints of free-ſtone. This is chiefly, or ought to be done upon heart-laths, becauſe the mortar will decay thoſe made of ſap in a very little time; and though it be more work to lath it with heart-laths, yet it is neceſſary, becauſe the mortar requires the laths cloſer together than loam. They commonly lay the mortar on two thickneſſes, viz. the laſt before the firſt is dry.

CASK, a veſſel of capacity for preſerving liquors of divers kinds, and alſo ſometimes dry goods, as ſugar, almonds, &c.

A caſk of ſugar is a barrel of that commodity, containing from eight to eleven hundred weight. A caſk of almonds is about three hundred weight.

A caſk in ſtaves, that of which all the ſtaves are ready prepared, and want only to be joined and hooped. They are often ſhipped thus on board the veſſels deſigned for the American iſlands, becauſe they take leſs room, and can be eaſily made up there.

CASSAVI, or CASSADA, the ſame with the jatropha of Linnæus. See the article JATROPHA.

Of the root of this plant, which is oblong and thick, the Americans make a kind of bread, ſaid to be a wholeſome and nouriſhing food.

CASSIA, *Caryophyllata*, the bark of a tree of the clove kind, brought from the iſland of Cuba, Jamaica, and other parts of the Weſt-Indies; rolled up in quills, like cinnamon, but ſomewhat thinner, rougher on the outſide, and of a darker ruſty brown colour.

This bark is a warm aromatic, nearly of the ſame kind of ſmell and taſte with the clove ſpice, but weaker, and with a little admixture, as it were, of the cinnamon flavour. It agrees nearly with cloves alſo in regard to the ſolubility and volatility of its active principles. Tinctures of it in rectified ſpirit, ſmell and taſte ſtrongly of the bark: the watery infuſions are conſiderably impregnated with its ſmell, but have very little of its taſte. On inſpiſſating the ſpirituous tincture, the ſpirit which diſtils has little or nothing of its flavour: the remaining extract ſmells lightly of the bark, and proves in taſte very hot and pungent, though much leſs ſo than the ſpirituous extract of cloves. In diſtillation with water, it yields a very ſmall portion of eſſential

oil, nearly similar in flavour to oil of cloves, but more pungent than the genuine oil of that spice: the remaining decoction is ungratefully austere and bitterish.

A bark of the same kind is sometimes brought from the East-Indies under the name of culitlawan, or culilawan, a Malaccan compound word, of which the Latin *cortex caryphylloides*, or clove bark, is said to be a translation. That distinguished in Europe by the name of calilawan, is thicker than the other, and in colour approaches somewhat more to cinnamon, but scarcely differs in smell or taste.

The same with this appears likewise to be the carabaccium of Baglivi; which he describes as being in taste like cloves, but very temperate and grateful, and in colour having a great resemblance to cinnamon; and which, he says, he made use of with great benefit in decoction, for correcting the acrimony and scorbutic dissolution of the lymph, and for strengthening the stomach and promoting digestion.

CASSIA *Fistularis*, a hard woody cylindrical pod of a tree resembling the walnut, which grows spontaneously in Egypt and the warmer parts of the East-Indies, and has been thence introduced into the West.

The pods or canes are about an inch in diameter, and a foot or more in length; externally, of a dark brown colour, somewhat wrinkled, with a large seam running the whole length upon one side, and another less visible on the opposite one; internally, of a pale yellowish colour, divided by thin transverse woody plates into a number of little cells, containing each a flattish oval seed, with a soft black pulp.

The pulp of cassia, whether moist or dry, dissolves both in water and in rectified spirit. It is usually extracted by boiling the bruised pods in water, and evaporating the strained solution to a due consistence: the exhaling vapour carries off nothing considerable of the cassia. As it is very apt to grow sour in keeping, only small quantities should be prepared at a time.

Cassia, in doses of a few drams, is a gentle laxative; of good use in costive habits, in inflammatory cases where purgatives of the more acrid or irritating kind can have no place; and, as Geoffrey observes, in the painful tension of the belly which sometimes follows the imprudent use of antimonials. It is rarely given in such doses as to have the full effect of a cathartic; the quantity necessary for this purpose, an ounce and a half, or two ounces, being apt to nauseate the stomach, and produce flatulencies and gripes, especially if the cassia is not of a very good kind: mild aromatics, and dilution with warm liquors, are the best correctives.

CASSIA *Lignea*, the bark of a tree of the cinnamon-kind, brought from the East-Indies; exactly resembling cinnamon in appearance, but distinguishable by its breaking short or smooth, while cinnamon breaks fibrous or shivery, like wood.

This bark resembles cinnamon in aromatic flavour as well as in external appearance; but differs in being weaker, or containing less active matter, and in its abounding with a viscous mucilaginous substance. Chewed, it dissolves as it were in the mouth into a kind of slime: powdered and boiled in water, it renders a considerable quantity of the fluid thick and glutinous, so as to concrete on cooling into the consistence of a jelly.

Cassia lignea was employed by the ancients as a succedaneum to cinnamon, of which it was reckoned equivalent to half its own quantity. At present it is not unfrequently mixed with that spice in the shops, but is scarcely ever made use of under its own name.

CASSINE, the cassia-berry-tree, in botany, a genus of plants, the flower of which is patent, divided into five suboval, obtuse segments larger than the cup; the fruit is a roundish berry with three cells, containing solitary suboval seeds. This plant is used in South America in the same manner as tea.

CASSIOPEA, in astronomy, a constellation of the northern hemisphere, situated next to Cepheus, and opposite to the great bear on the other side of the pole.

In the year 1572, there appeared a comet in this constellation, which continued visible about eighteen months and then disappeared again. This comet appeared to the naked eye about the magnitude and brilliancy of Jupiter; which made some imagine it only to be a new star that made its appearance and then vanished again; but such must be very superficial, or little practiced in astronomy or astronomical observations. However, it greatly alarmed the astronomers of that age, many of whom wrote dissertations upon it, to prove that it was the same comet that appeared to the magi, or wise men of the East, at the birth of Christ.

In fabulous history, we are told, that Cassiopea was the wife of Cepheus and the mother of Andromeda, whom Perseus married, and for his sake was translated into heaven, as some write. Others say, that her beauty being singular, she became so exceeding proud, that she preferred herself before the Neriads, who were the nymphs of the sea; for which cause they placed her in the heavens with her head downwards; so that in their apparent revolution she might seem to be carried or hurled headlong, for an example to all such who should, in the pride of their hearts, advance themselves above their superiors.

We fancy were all the ladies in these days that are found guilty of this crime, placed in heaven in the same position, our astronomers royal would never be at a loss for objects to put all the unformed

formed ſtars into conſtellations. The ſtars of this conſtellation, according to Ptolemy, are thirteen, in Tycho twenty-eight, and in the Britiſh Catalogue fifty-five, as follow, with their places, &c.

Order.	Magn.	Name.	Bayer Let.	Right Aſcenſion	Diſtance from Nor. Pole.	Var. in Right Aſcen.	Var. in Declination.
				° ′ ″	° ′ ″	″	″
1	6		*e*	344. 8. 4	31.52.10	36. 0	19. 0
2	7			344.50.34	31.57.37	36. 2	19. 5
3	6			348.22.13	32.38.46	37. 5	19. 6
4	5	1ma ad	*d*	348.38.40	29. 5. 8	39.02	19. 6
5	5		τ	353.50.40	32.40.99	42. 2	19. 7
6	6			354.19.55	29. 6.47	42. 2	19. 7
7	6		ϱ	355.37. 1	33.49.53	43. 5	19. 8
8	6		σ	356.43.15	35.34.30	44. 0	19. 8
9	6			358. 0. 9	29. 2.49	44. 2	19. 9
10	6			358.32.35	27. 7.57	44. 5	19. 9
11	3.2		β	359.12.47	32.13.46	45.70	20.05
12	6			2.55.33	29.29.38	46. 0	20. 0
13	6			4.28.45	24.48.29	47. 0	20. 1
14	5		λ	4.38.56	36.48. 0	46. 5	20. 0
15	4		κ	4.53.55	28.23.26	47. 2	20. 1
16	6			5.19.35	24.34.38	47. 5	20. 0
17	4		ξ	5.56. 2	37.34.38	48. 0	20. 0
18	3	Schedir.	α	6.53.51	34.50.11	49.58	19. 9
19	6		ξ	7. 9.54	40.48.31	47. 5	19. 9
20	6		π	7.31.53	44.17.22	47. 0	19. 9
21	6			7.40.20	16.20.11	51. 2	19. 9
22	6		ο	7.51. 4	43. 1.24	47. 0	19. 8
23	6			8.13.20	16.28.37	51. 5	19. 8
24	4		η	8.35. 2	33.27. 6	48. 0	19. 8
25	5		ν	8.47.47	40.20.26	47. 5	19. 8
26	7	1ma ad	υ	10.38.35	32.19.31	50. 0	19. 7
27	3		γ	10.45. 3	30.38.33	52.42	19. 7
28	6	2da ad	υ	10.37.43	32. 6.43	50. 0	19. 7
29	6			12.31. 4	26.16. 9	52. 2	19. 7
30	5		μ	12.21. 6	26.15.10	52. 2	19. 6
31	6			13.36.46	22.30.15	53. 0	19. 5
32	6			14. 3.11	26.15.16	53. 0	19. 5
33	4		θ	14.18.37	36.11.11	52.90	19.44
34	6			16.16.34	33. 2. 3	51. 5	19. 3
35	7			16.16.34	33. 2. 3	51. 5	19. 2
36	5.6		ψ	17.17.21	23. 7.41	56. 0	19. 1
37	3		δ	17.44.49	31. 4.21	56.25	19.12
38	6			18.24.53	21. 0.47	58. 0	19. 0
39	6		χ	19.36. 0	32. 0. 4	53. 5	18. 9
40	6		*h*	19.52.16	18.11.26	57. 5	18. 7
41	6			21.17.55	18.35.57	58. 0	18. 6
42	6		*g*	21.10.15	20.36.20	60. 5	18. 5
43	6		*c*	21.11.41	23.11.22	58. 7	18. 4
44	6			21.49. 3	31.39.59	55. 7	18. 3
45	3		ε	24.35. 0	27.34.30	62.18	18.27
46	6	2da ad	*d*	24.23.50	22.30.29	61. 2	18. 1
47	5			25.28.15	13.53.15	73. 2	18. 0
48	5		*e*	25.39.26	20.14.52	64. 2	17. 9

Order.	Magn.	Name.	Bayer Let.	Right Aſcenſion	Diſtance from Nor. Pole.	Var. in Right Aſcen	Var. in Declination.
				° ′ ″	° ′ ″	″	″
49	6		*f*	25.50.12	15. 3.40	71.7	17.8
50	4.5			25.50.40	18.45.15	66.0	17.7
51	6			26.18.47	16.34.56	69.5	17.7
52	7			26.15.44	26.46.19	59.5	17.6
53	7			26.19.40	26.16.21	60.0	17.5
54	6			27.14.52	19.35.49	66.2	17.4
55	6			28.57.34	24.37.17	63.1	17.0

CASSOCK, or CASSULA, a kind of robe or gown, wore over the reſt of the habit, particularly by the clergy.

The word caſſock comes from the French *caſaque*, an horſeman's coat; ſome derive that again from the garment of the Coſſacs.

CASSOWARY, in ornithology, makes a diſtinct genus of birds, of the order of the gallinæ; the characters of which are theſe: its feet have each three toes, all placed forward; and its head is ornamented with a kind of bony comb and naked wattles.

There is only one ſpecies of this genus, which is a robuſt, large, and thick bird, meaſuring four feet and an half when it ſtretches out its neck.

CASSMUNAR, in the materia medica, is the root of an Eaſt-India plant, of which we have no certain account; brought over in irregular ſlices of various forms, ſome cut tranſverſely and others longitudinally: the corticle part is marked with circles, and of a duſky browniſh colour: the internal part is paler, and unequally yellow.

This root was introduced ſome time ago by Marloe, as a medicine of uncommon efficacy in hyſteric, epileptic, paralytic, and other nervous diſorders. At preſent it is ſometimes employed as a ſtomachic; but its uſe is not yet become ſo general as it ſeems to deſerve. It is an elegant mild aromatic, moderately warm, lightly bitteriſh; in ſmell ſomewhat reſembling ginger.

CASTANEA, the cheſnut-tree, in botany, a genus of trees, whoſe characters are: the flower is of the amentaceous kind, being compoſed of a number of ſtamina, ariſing from a five leaved cup, and fixed to a ſlender capillament, or axis. Theſe are the male flowers, but the fruit grows on other parts of the tree; theſe are roundiſh, echinated, and open into four parts, and contain cheſnuts with their kernels.

M. Tournefort has enumerated four, and Mr. Miller five ſpecies of caſtanea.

Theſe trees are propagated by planting them in February, in beds of freſh, undunged earth: the beſt nuts for ſowing are ſuch as are brought from Portugal and Spain, and are commonly ſold in winter for eating, provided they are not kiln dried, which

which is generally the caſe of thoſe brought from abroad, which is done to prevent their ſprouting or rooting in their paſſage; therefore, if they cannot be procured freſh from the tree, it will be much better to uſe thoſe of the growth of England, which are full as good to ſow, for timber or beauty, as any of the foreign nuts, though their fruit are much ſmaller; theſe ſhould be preſerved until the ſeaſon for ſowing, in ſand, where mice, or other vermin, cannot come to them, otherwiſe they will ſoon deſtroy them. Before you ſet them, it will be proper to put them into water, to try their goodneſs, which is known by their ponderoſity; thoſe of them that ſwim upon the ſurface of the water ſhould be rejected, as good for nothing; but ſuch as ſink to the bottom you may be ſure are good.

In April theſe nuts will appear above ground; you muſt, therefore, obſerve to keep them clear from weeds, eſpecially while young: in theſe beds they may remain for two years, when you ſhould remove them into a nurſery, at a wider diſtance. The beſt ſeaſon for tranſplanting theſe trees is either in October, or the latter end of February; but October is the beſt ſeaſon: the diſtance they ſhould have in the nurſery, is three feet, row from row, and one foot in the rows.

After having remained three or four years in the nurſery, they will be fit for tranſplanting, either in rows, for avenues to a houſe, or in quarters, for wilderneſs plantations; but if you intend them for timber, it is much the better method to ſow them in furrows, as is practiſed for oaks, &c. and let them remain unremoved; for theſe trees are apt to have a downright tap root, which being hurt by tranſplanting, is often a check to their upright growth, and cauſes them to ſhoot out into lateral branches, as is the caſe with the oak, walnut, &c.

CASTANET, a muſical inſtrument of the pulſative kind, wherewith the Moors, Spaniards, and Bohemians, accompany their dances, ſarabands, and guitars, ſerving only to direct the time.

It conſiſts of two little round pieces of wood, dried and hollowed, in the manner of a ſpoon; the concavities whereof are placed one on another, faſtened to the thumb, and beat, from time to time, with the middle finger, to direct their motions and cadences: they may beat eight or nine times in the ſpace of a meaſure, or ſecond of a minute.

CASTELLAN, the name of a dignity or charge in Poland: the caſtellans are ſenators of the kingdom, but ſenators only of the lower claſs, who, in diets, ſit on low ſeats, behind the palatines, or great ſenators. They are a kind of lieutenants of provinces, and command a part of the palatinate under the palatine.

CASTILLAN, or CASTILLANE, a gold coin, current in Spain, and worth fourteen rials and ſixteen deniers.

CASTILLAN is alſo a weight uſed in Spain for weighing gold. It is the hundredth part of a pound Spaniſh weight.

What they commonly call a weight of gold in Spain, is always underſtood of the caſtillan.

CASTING, in foundery, the running of a metal into a mould, prepared for that purpoſe.

CASTING *of Lead*, is the uſing a frame, or mould, covered with ſand, to caſt the lead into ſheets.

CASTING *of Metals, of Letters, Bells, Figures*, &c. See the article FOUNDERY.

CASTING *in Sand and Earth*, is the running of metals between two frames, or moulds, filled with ſand or earth, wherein the figure that the metal is to take has been impreſſed *en creux*, by means of the pattern.

CASTING, among ſculptors, implies the taking caſts and impreſſions of figures, buſts, medals, leaves, &c.

The method of taking off caſts of figures and buſts, as at preſent practiſed, is moſt generally by the uſe of plaſter of Paris; or, in other words, alabaſter calcined by a gentle heat. The advantage of uſing this ſubſtance preferably to others, conſiſts in this, that notwithſtanding a ſlight calcination reduces it to a pulverine ſtate, it becomes again a tenacious and cohering body, by being moiſtened with water, and afterwards ſuffered to dry; by which means either a concave or a convex figure may be given by a proper mold or model to it when wet, and retained by the hardneſs it acquires when dry: and from theſe qualities, it is fitted to the double uſe of making both caſts and molds for forming thoſe caſts. The plaſter is to be had ready prepared for thoſe who make it their buſineſs to ſell it; and the only care is to ſee that it is genuine.

CASTLE-WARD, or CASTLE-GUARD, a tax laid on ſuch as dwell within a certain diſtance of a caſtle, towards the maintenance of thoſe that watch and ward the caſtle: the word is ſometimes uſed for the circuit itſelf inhabited by ſuch as are ſubject to this ſervice.

CASTLE-WORK, ſervice or labour done by inferior tenants for the building and upholding of caſtles of defence, towards which ſome gave their perſonal aſſiſtance, and others paid their contributions. This was one of the three neceſſary charges to which all lands among our Saxon anceſtors were expreſsly ſubject.

CASTOR. See BEAVER and CASTOREUM.

CASTOR, in aſtronomy, the name of one of the twins in the conſtellation Gemini; as likewiſe of the ſtar marked alpha by Bayer in the ſame conſtellation, or the ſixty-ſixth, according to the Britiſh order. See the catalogue of Gemini for Caſtor's place.

CASTOR and POLLUX, two meteors which ſometimes, in a ſtorm at ſea, appear ſticking to ſome part of

of the ſhip, in the ſhape of two fire-balls: when only one is ſeen, it is more properly called Helena. The two together are adjudged to portend a ceſſation of the ſtorm; but one alone portends ill, and that the ſevereſt part of the tempeſt is yet to come: both theſe balls are by ſome called Tyndarides.

CASTOREUM, CASTOR, the inguinal glands of the caſtor or beaver, a four footed amphibious animal, frequent in ſeveral parts of Europe, and in North-America. Theſe glands are of different ſhapes and ſizes, covered with a thick ſkin, including an unctuous liquid matter, which in keeping grows dry and hard: on cutting the dry cods, as they are called, they are found full of a brittle friable ſubſtance, of a browniſh red colour, interſperſed with fine membranes and fibres exquiſitely interwoven. The beſt caſtor comes from Ruſſia, in large round, hard cods; an inferior ſort, ſmaller and moiſter, from Dantzick; the worſt of all from New England, in longiſh thin cods.

Ruſſia caſtor has a ſtrong not agreeable ſmell, and a biting bitteriſh naſeous taſte: the other ſorts are weaker than that of Ruſſia, yet more ungrateful. It is generally looked upon as one of the capital nervine, antiſpaſmodic, and antihyſteric medicines: its virtues have undoubtedly been much exaggerated; but though they are not near ſo great as they have by moſt writers been repreſented, they appear nevertheleſs to be conſiderable. The common doſe is from two or three grains to a ſcruple; though it has been ſometimes taken by drams, and theſe doſes very often repeated.

Caſtor is commonly joined in preſcription with the deobſtruent fetid gums, volatile alkaline ſalts, the volatile oily ſpirits, and other materials of ſimilar intention. The volatile oily ſpirits are well adapted alſo as menſtrua for diſſolving the active matter of the caſtor, at the ſame time that they prove in many caſes excellent additions to its virtue, as particularly in ſome hyſteric diſorders, and the ſeveral ſymptoms which accompany them: in this view, an ounce of Ruſſia caſtor, and half as much aſafetida, are digeſted about ſix days, in a cloſe veſſel, with a pint of the volatile ſpirit.

CASTRATION, in ſurgery, the operation of gelding. See SARCOCELE.

CASU CONSIMILI, in law, a writ of entry granted where a tenant, by courteſy or for life, aliens either in fee, in tail, or for the term of another's life. It is brought by him in reverſion againſt the perſon to whom ſuch tenant does ſo alien to the prejudice of the reverſioner, in the tenant's like-time.

CASU PROVISO, in law, a writ of entry founded on the ſtatute of Glouceſter, where a tenant in dower aliens the lands ſhe ſo holds in fee, or for life; and lies for the party in reverſion againſt the alience.

CAT, *Felis*, a well known quadruped, of the order of the feræ, or beaſts of prey. See the article FELIS.

CAT, in the marine, a ſort of taicle, or complication of pullies, to draw the anchor perpendicularly up to the cat-head.

CAT-MINT, in botany, the Engliſh name of the cataria of botaniſts.

CAT *of the Mountain*, *Catus Pardus*, an animal of the cat-kind, about the ſize of a maſtiff, variegated with longitudinal black ſtreaks on the upper-part of the body, and black ſpots on the under-part.

CATABIBAZON, in aſtronomy, the moon's deſcending node; alſo called the dragon's-tail.

CATACAUSTICS, or CAUSTICS, in the higher geometry, are curves formed by reflected rays. Mr. Mac Laurin defines them thus: rays of light being ſuppoſed to iſſue from a given point, and to be reflected by a given curve, ſo as to make the angle of reflection equal to the angle of incidence, a curve that touches all the reflected rays, is called the cauſtic by reflection. Thus, let S (Plate XXX. *fig.* 4.) be the given point from which the rays iſſue, which is therefore called the focus of the incident rays; S L any incident ray, P L*p* the tangent at L, L C the ray of curvature at L, L *m* the reflected ray conſtituting the angle C L *m* equal to C L S; then, if the reflected rays always touch the curve *h m e*, it is the cauſtic by reflection. Let S P, perpendicular to the tangent L P, meet it always in P, a point of the curve D P; let H M E be the curve by the evolution of D P is deſcribed, and let P M touch H M E in M; join S M, and produce it to *m*; ſo that S *m* be equal to Q S M: then *m* ſhall be a point in the cauſtic of the curve B L, when S is the radiating point. For, becauſe M P is perpendicular to the curve D P, the angle M P S is equal to the complement of S L P, or to L S P, and S L is biſected by M P in K; therefore S *m* is to S M as S L is to S K. L *m* is parallel to K M, the tangent of H M E: but the figure *h m e* is ſimilar to H M E, and ſimularly ſituated; therefore L *m* is the tangent of *h m e*. Becauſe L *m* is parallel to P M, the angle *m* L C is equal to M P S, or L S P, or C L S; therefore, when S L is the incident ray, L *m* is the reflected ray, and *m* is a point to the cauſtic.

Again, let L *f* be taken on the reflected ray equal to L S; and C R being perpendicular from the center of curvature on this ray in R, biſect L R in *q*; and *q f*, *q* R, and *q m* ſhall be in continued proportion. For *f q*, *f* L and 2 P M are in continued proportion. Let C I be perpendicular to S L in I, and I L be biſected in Q; when S is on the concave ſide of the curve, and L S is greater than L Q, P M is equal to the ſum of P K (or S K) and K M, and 2P M is equal to the ſum of *f* L and L *m*; therefore *f q* is to *q* L or *q* R as *f* L is to L M, or as *q* R is to *q m*. When S is betwixt Q and L,

2 P M is equal to the difference of Lm and Lf, and fq is to q L, as f L is to Lm, or as q L or q R is to qm. In like manner it appears, that when S is on the convex ſide of the curve fq, q R or q L, and qm are in continued proportion. When the incident ray is perpendicular to the curve (as in *fig.* 5.) the reflected ray coincides with the incident ray; f with S, R and C, and qm, q C, q S are in continued proportion. In general the rectangle fqm is equal to the ſquare of q R or q L; and when the incident rays are parallel, the point muſt coincide with q and Lm, and be equal to one half of L R. When L S is equal to one half of L I, and S is on the concave ſide of the curve, f coincides with q, and the reflected ray Lm becomes an aſymptote of the cauſtic.

Again, let B L be a circle, (*fig.* 6.) C the center, C B the radius that paſſes through S, the radiating point; biſect B C in q. Let q S, q C, and q H, be in continued proportion: when C S is leſs than one half of C B, the curve D P has no point of contrary flexure, and the cauſtic has no aſymptote. When C S is equal to one half of C B the diameter, through S is the aſymptote to the cauſtic. When C S is greater than one half of C B, but leſs than C B, the cauſtic meets C B produced beyond B, the part of the curve D P, adjoining to B, is convex towards S; P is a point of contrary flexure, when S L is one fourth part of the chord L Z that paſſes through S, and the reflected ray is then an aſymptote of the cauſtic.

Again, let S A (*fig.* 4.) be a right line given in poſition, and Lm ſhall be to S L as the fluxion of the angle A S L to the fluxion of 2 A S P—A S L. Hence Lm is to S L in an invariable ratio; becauſe the angle A S L is to A S P in an invariable ratio, only, in the parabola; S being the focus the fluxion of A S L, is equal to the fluxion of 2 A S P, and the reflected rays are parallel to each other, and to the axis of the figure. It may not be amiſs to give an example of deſcribing the cauſtic by reflection to a given curve.

Let the curve be the logarithmetic ſpiral as repreſented by A C D, (*fig.* 7.) and ſuppoſe the rays of incidence to iſſue from the luminous point A its center, and let it be required to deſcribe the catacauſtic A F K by reflection.

Let the line C H be drawn perpendicular to the curve in the point C, and A H perpendicular to the ray of incidence A C, then the point H will be in the evoluta of the curve, and conſequently A C will be equal to y the abciſſa of the curve, which is equal to a; whence C F $= \frac{ay}{2y-a}$ will be equal to y, and the triangle A C F will be an iſoſcles triangle; and becauſe the angle of incidence A C V is equal to the angle of reflection F C S; therefore the angle A F C is equal to A C V; and this angle A C V, being a conſtant quantity, by the nature of the curve; therefore the angle A F C will be a conſtant quantity, and the cauſtic by reflection A F K will be a logarithmetic ſpiral, differing from the given ſpiral only in poſition.

When the given curve is a geometrical one, the cauſtic will be ſo too, and the cauſtic will always be rectifiable. The cauſtic of a circle is a cycloid, formed by the revolution of a circle along a circle. The cauſtic of the vulgar ſemi-cycloid, when the rays are parallel to the axis thereof, is alſo a vulgar ſemi-cycloid, formed by the revolution of a circle on the ſame baſe.

CATACHRESIS, in rhetoric, a trope which borrows the name of one thing to expreſs another. Thus Milton, deſcribing Raphael's deſcent from the empyreal Heaven to Paradiſe, ſays,

"Down thither prone in flight
"He ſpeeds, and through the vaſt ethereal ſky
"Sails between worlds and worlds."

CATACOMB, a grotto or ſubterraneous place for the burial of the dead.

The term is particularly uſed in Italy for a vaſt aſſemblage of ſubterranneous ſepulchres, three leagues from Rome, in the Via Appia, ſuppoſed to be the ſepulchres of the ancients. Others imagine theſe catacombs to be the cells wherein the primitive Chriſtians hid themſelves. Each catacomb is three feet broad, and eight or ten high, running in form of an alley or gallery, and communicating with one another.

Some authors ſuppoſe them to have been the puticuli mentioned by Feſtus Pompeius, into which the Romans threw the bodies of their ſlaves, to whom they denied the honours of burying: and Mr. Monro, in the Philoſophical Tranſactions, gives it as his opinion, that the catacombs were the burial-places of the firſt Romans, before the practice of burning the dead was introduced; and that they were dug in conſequence of theſe opinions, that ſhades hate the light, and love to hover about the places where their bodies were laid.

CATACOUSTICS, an appellation given to the doctrine of reflected ſounds. See ECHO.

CATADIOPTRICAL TELESCOPE, that otherwiſe called a reflecting one. See the article TELESCOPE.

CATADROME, an engine like a crane, uſed by builders in raiſing weights.

CATADUPA, a water-fall, or cataract. See the article CATARACT.

Hence the inhabitants about the cataracts of the Nile were called catadupi by the ancients.

CATAFALCO, in architecture, a decoration of ſculpture, painting, &c. raiſed on a timber-ſcaffold, to ſhew a coffin or tomb in a funeral ſolemnity.

CATALEPSY, *Catalepſis*, in phyſic, a kind of apoplexy; or a diſeaſe wherein the limbs are eaſily flexible,

flexible, and continue in whatever position they are placed.

The word is derived from καταλαμβανω, to seize, or interrupt.

The natural causes which generally bring on the paroxysms of a catalepsis, are a peccancy of the thick and viscid humours, and intense cold; and the accidental are violent commotions of the mind, grief, terror, joy, fear, and sadness.

As to the prognostics of a catalepsis, if it is produced by the passions of the mind, or profound meditations, it is seldom attended with dangerous consequences: but, on the contrary, when it proceeds from a thick, viscid, and impure blood, or from a suppression of accustomed evacutions of blood, it is highly dangerous; for it either terminates in melancholy, or is changed into an epilepsy; or, lastly, terminates in a violent apoplexy, and kills the patient. Nor is the congelation brought on by extreme cold of less danger; since, if seasonable relief is not afforded, sudden death ensues.

In the cure of this terrible disorder, two curative intentions are principally to be regarded. The first is to relax the spasmodic stricture of the small nervous fibres in the brain. The second is cautiously to remove the material or secondary causes which contribute to the production of this constriction. The former is principally to be answered during the paroxysm, but the latter when the person is out of it.

CATALLIS Captis Nomine Districtionis, in law, a writ which lies where a house is within a borough, for rent issuing out of the same: and this writ warrants the taking of doors or windows by way of distress.

Catallis Redendis, a writ that lies where goods being delivered to a person to keep until a certain day, are not on demand delivered on that day.

CATALOGUE, a list or enumeration of the names of several books, men, or other things, according to a certain order.

Catalogue *of Stars*, an enumeration of the constellations, with the stars belonging to each, put down in a list according to their place, or order of passing the meridian, with their number, both formed and unformed, as likewise their magnitude, variations, &c. or whatever may be of use to the practical astronomer, for his more readily applying any, or such of them as is most suitable, to adjust the motions of the planets, comets, &c.

Pliny informs us in his Natural History, that Hipparchus of Rhodes, observing the appearance of a new star, began to think there might be changes amongst the fixed stars; he therefore began to construct a catalogue of them, that in time to come, if any new stars should appear, or any of those already observed should vanish or diminish, such changes could not escape unnoticed to after-ages.

The most ancient catalogue is that of Ptolemy, which contains 1026 stars. These were chiefly copied from Hipparchus, only he corrected their places by his own observations, made in the beginning of the reign of Antoninus Pius, about the year 140.

According to the learned Hyde, the Arabians were the next after Ptolemy, who made a catalogue of the stars; he mentions several, and published the most considerable among them in Arabic, with a Latin translation: it was made by Ulug Beigh, grandson to Tamerlane, from his own observations made at Scamercand. The number of stars in this catalogue were 1022, and their places settled to the year 1437.

The third, who made a catalogue from his own observations, was Tycho Brahe, who determined the places of 777 stars for the year 1600: which Kepler, from other observations of Tycho's, afterwards increased to 1000, which he published with the Rudolphine tables.

At the same time, William, landgrave of Hesse, with the assistance of Rothmannus and Justus Byrgius, settled the places of 400 fixed stars by his own observations, which Hevilius prefers to those of Tycho. Ricciolus, in his Astronomia Reformata, determined the places of 101 stars for the year 1700, from his own observations. Dr. Halley, in the year 1677, at the island of St. Helena, observed 350 southern stars, not visible in our horizon. The same labour was repeated by F. Noel in 1710, who published a new catalogue of the same stars, settled for the year 1687. The next was J. Hevelius, who made a catalogue of 1888 fixed stars, whereof 950 had been observed by the antients, 350 by Dr. Halley, and 603 by himself.

The largest and most complete is the British catalogue constructed by Mr. Flamstead; it contains 2936 stars, their places being rectified to the year 1689; but in this Dictionary to the year 1770, and from more accurate observations.

Bayer, in his Uranometria, published a catalogue of 1160 stars, though not from his own observations, but chiefly compiled from those of Ptolemy and Tycho. What makes this catalogue valuable is, that each star in every constellation is marked with some letter; so that the biggest star in every constellation is denoted by the first letter of the Greek alphabet, and the next biggest by the second, &c. but if the constellation contains a greater number of stars than there are letters, than those that remain are marked by the Roman alphabet: by this means every star is easily distinguished.

CATAMENIA, in medicine, the same with menses. See Menses.

CATANANCHE, in botany, a genus of plants producing compound flowers. The proper flower is monopetalous, ligulated, linear, longer than the calyx, truncated and quinquedentated. The germen

men is ſituated below the flower, and becomes afterwards a ſolitary compreſſed ſeed, crowned with a little cup of four or five hairs.

CATAPACTYME, a feſtival kept by the Peruvians in the month of December, in honour of the ſun the father, the ſun the ſon, and the ſun the brother.

CATAPAN, a name given by the Greek emperors to the governor of Puglia and Calabria in Italy. They ſucceeded the exarchs of Ravenna; and Du Cange is of opinion, a chronological table of theſe governors might be very ſerviceable for underſtanding the Byzantine hiſtorians.

CATAPASM, among ancient phyſicians, ſignifies any dry medicine reduced to powder, in order to be uſed by way of inſpiration in the whole body, or any part of it. Some catapaſms are appropriated to ulcers, ſome to the ſkin: the former cicatrize, the later are deterſive. We learn from Pliny, that catapaſms of roſes were uſed to reſtrain ſweat, and to dry the body after bathing.

CATAPHONICS, the ſcience which conſiders the properties of reflected ſounds. See the article ECHO.

CATAPHORA, in medicine, the ſame as coma. See the article COMA.

CATAPHRACTA, in antiquity, a kind of coat of mail, which covered the ſoldier from head to foot.

Hence cataphracti were horſemen armed with the cataphracta, whoſe horſes, as Salluſt ſays, were covered with linen full of iron plates diſpoſed like feathers.

CATAPHRYGIANS, ancient heretics, who took their name from the country of Phrygia. They ſuppoſed the Holy Spirit had abandoned the church, and therefore that Montanus, as a prophet, and Priſcilla and Maximilla, as true propheteſſes, were to be conſulted in every thing relating to religion. See the article MONTANIST.

CATAPLASM, in pharmacy, an external ſoft kind of medicine of the conſiſtence of pretty thick panada, and prepared of ingredients of different virtues, according to the intention of the phyſician.

The word is formed from κατα, with, and πλασσω, to anoint.

CATAPULTA, in antiquity, a military engine contrived for throwing of arrows, darts, and ſtones upon the enemy. Some of theſe engines were of ſuch force, that they would throw ſtones of an hundred weight. Joſephus takes notice of the ſurpriſing effects of theſe engines, and ſays, that the ſtones thrown out of them beat down the battlements, knocked off the angles of the towers, and would level a whole file of men, from one end to the other, were the phalanx never ſo deep.

CATARACT, in hydrography, a precipice in the channel of a river, cauſed by rocks, or other obſtacles, ſtopping the courſe of the ſtream, from whence the water falls with a great noiſe and impetuoſity: ſuch are the cataracts of the Nile, the Danube, Rhine, and the famous one of Niagara in America.

CATARACT, in medicine and ſurgery, a diſorder of the humours in the eye, by which the pupilla that ought to appear tranſparent and black, looks opaque, grey, blue, brown, &c. by which viſion is variouſly impeded, or totally deſtroyed.

The ordinary and moſt common cauſe of cataracts, is from an opacity in the cryſtalline lens: it appears that it may ſometimes be cauſed by a membrane in the aqueous humours, which cauſe was the only one aſcribed to cataracts till the preſent century.

Cataracts have been diſtinguiſhed by ſurgeons and oculiſts into various ſpecies, as into recent and inveterate, incipient and confirmed, mature and immature, ſimple and complicated, immoveable and ſhaking, milky and purulent, true and ſpurious, and into curable and incurable. There is ſcarce any diſorder, the event of which is more uncertain than that of a cataract: medicines will generally have little or no effect when the diſorder is confirmed, or inveterate, notwithſtanding what ſome may boaſt of their wonderful arcana for this purpoſe: almoſt the ſole relief is therefore had from the ſurgeon's hand and inſtruments. For the proceſs of this operation, ſee the article COUCHING *of Cataracts*.

Though moſt people reject all methods of treating cataracts by medicines as uſeleſs and trifling, yet there are ſome caſes in this diſorder which ought to be recommended to the care of the phyſician, who by directing a proper regimen and courſe of phyſic, adapted to the patient's habit, age, and other circumſtances, may by the aſſiſtance of nature remove cataracts beyond expectation.

CATARRH, in medicine, a diſtillation or defluxion from the head upon the mouth and aſpera arteria, and through them upon the lungs.

The cauſe of this diſorder proceeds from the lymph, or maſs of blood, moſt frequently in the winter time, as it commonly ariſes from a cold. If it is attended with a fever, as it almoſt always is, in ſome degree, it is called a catarrhous fever.

The catarrhus ſuffocatius is a violent and ſuffocating cough, excited either by an exceſſive catarrh, or cold; by the rupture of a vomica in the lungs; by a polypus driven from the heart in the pulmonary artery; or ſometimes by a ſpaſmodic conſtitution of the nerves, as it happens in ſome hyſteric caſes.

Catarrhous diſorders, as well as all other feveriſh indiſpoſitions, are to be treated in a mild and gentle manner; and the patient is to be kept moderately warm, either in bed, or by means of a fire: he is to abſtain from medicines which are too hot, draſtic, and productive of commotions; as alſo from a hot regimen.

regimen. The diet is to be ſpare, and the drink tepid and wholeſome: the moſt proper is excorticated barley, with ſhavings of hartſhorn, raiſins, and liquorice root.

When the effervescence is violent, a few grains of nitre may be advantageouſly mixed with the bezoardic powders; and emulſions muſt be plentifully drank: when during this diſorder, the fæces are indurated, and the patient coſtive, beſides watergruel, decoctions of manna, &c. are to be drank; and nothing is more proper than emollient clyſters.

Some diſtinguiſh catarrhs into three kinds, calling it bronchus, when the humours of the head fall upon the jaws; coryza, when they fall upon the noſtrils; and rheum, when they fall on the breaſt. See the articles BRONCHUS, CORYZA, and RHEUM.

CATASTASIS, *κατασασις*, in poetry, the third part of the ancient drama, being that wherein the intrigue, or action, ſet forth in the epitaſis, is ſupported and carried on, and heightened, till it be ripe for the unravelling in the cataſtrophe. Scaliger defines it, the full growth of the fable, while things are at a ſtand in that confuſion to which the poet has brought them.

CATASTROPHE, in dramatic poetry, the fourth and laſt part in the ancient drama, or that immediately ſucceeding the cataſtaſis: or, according to others, the third only; the whole drama being divided into protaſis, epitaſis, and cataſtrophe; or, in the terms of Ariſtotle, prologue, epilogue, and exode.

The cataſtrophe clears up every thing, and is nothing elſe but the diſcovery or winding up of the plot. It has its peculiar place, for it ought entirely to be contained, not only in the laſt act, but in the very concluſion of it; and when the plot is finiſhed, the play ſhould be ſo alſo. The cataſtrophe ought to turn upon a ſingle point, or ſtart up on a ſudden. The great art in the cataſtrophe is, that the clearing up of all difficulties may appear wonderful, and yet eaſy, ſimple, and natural.

It is a very general, but very prepoſterous artifice of ſome writers, to ſhew the cataſtrophe in the very title of the play. Mr. Dryden thinks that a cataſtrophe reſulting from a mere change in ſentiments and reſolutions of a perſon, without any other machinery, may be ſo managed as to be exceeding beautiful. It is a diſpute among the critics, whether the cataſtrophe ſhould always fall out favourably on the ſide of virtue, or not. The reaſons on the negative ſide ſeem to be the ſtrongeſt. Ariſtotle prefers a ſhocking cataſtrophe to a happy one. The cataſtrophe is either ſimple or complex; the firſt is that in which there is no change in the ſtate of the principal perſons, nor any diſcovery or unravelling, the plot being only a mere paſſage out of agitation into quiet repoſe. In the ſecond, the principal perſons undergo a change of fortune, in the manner already defined.

CATCH, or CATCHES, in mechanics, thoſe parts which lay hold of others by hooking or catching hold of them.

CATCH-FLY, in botany, a perennial plant, producing gramineous leaves, which come out of the root without order, and lay near the ground: between theſe come up ſtraight ſingle geniculated ſtalks, about a foot and a half high; from each joint come out two leaves placed oppoſite, and like the lower ones; the ſtalk is terminated in a looſe ſpike of red-purple flowers: theſe appear in May or June.

The double ſort of catch-fly is very common in gardens: it is a plant which will bear the ſevereſt of our winters; and is eaſily propagated by parting the roots in autumn. For the generical characters of this plant, ſee the article LYCHNIS, of which it is a ſpecies.

CATCH-WORD, among printers, that placed at the bottom of each page, being always the firſt word of the following page.

CATECHISM is defined in the Liturgy of the church of England, an inſtitution to be learned of every perſon before he brought to be confirmed by the biſhop.

The catechiſms of the primitive church uſually began with the doctrine of repentance and remiſſion of ſins, the neceſſity of good works, and the nature and uſe of baptiſm; then followed the explanation of the ſeveral articles of the creed, to which ſome added the doctrine of the immortality of the ſoul, and an account of the canonical books of Scripture.

The time appointed for catechizing are Sundays and holidays. Every parſon, vicar, or curate, are enjoined upon every Sunday and holiday, to teach and inſtruct the youth, and ignorant perſons of his pariſh, in the catechiſm ſet forth in the book of Common-Prayer; and that under the penalty of a ſharp reproof for the firſt omiſſion, ſuſpenſion for the ſecond, and excommunication for the third.

CATECHIST, an officer in the primitive Chriſtian church, whoſe buſineſs it was to inſtruct the catechumens in the firſt principles of religion, and thereby prepare them for the reception of baptiſm.

This office might be performed by an eccleſiaſtic of any order, and it was ſometimes done by the biſhop himſelf.

CATECHU, in the materia medica. See TERRA *Japonica*.

CATECHUMEN, a candidate for baptiſm, or one who prepares himſelf for the receiving thereof.

The catechumens, in church hiſtory, were the loweſt order of Chriſtians in the primitive church. They had ſome title to the common name of Chriſtian, being a degree above pagans and heretics, though not conſummated by baptiſm. They were admitted to the ſtate of catechumens by the impoſition of hands and the ſign of the croſs. The

children of believing parents were admitted catechumens as ſoon as ever they were capable of inſtruction: but at what age thoſe of heathen parents might be admitted is not ſo clear. As to the time of their continuance in this ſtate, there were no general rules fixed about it; but the practice varied according to the difference of times and places, and the readineſs and proficiency of the catechumens themſelves.

CATEGOREMA, among logicians, denotes much the ſame with predicament or category. See the article CATEGORY.

CATEGORICAL, whatever partakes of the nature of a category. Thus, a categorical order requires the ſubſtance to go before the accident. And categorical anſwers are pertinent and preciſe replies to the facts or objections propoſed. See the article CATEGORY.

CATEGORY, κατηγορια, in logic, a ſeries or order of all the predicates or attributes continued under any genus.

The ſchool philoſophers diſtribute all the objects of our thoughts and ideas into certain genera or claſſes, not ſo much, ſay they, to learn what they do not know, as to communicate a diſtinct notion of what they do know; and theſe claſſes the Greeks called categories, and the Latins predicaments.

Ariſtotle made ten categories, viz. quantity, quality, relation, action, paſſion, time, place, ſituation, and habit, which are uſually expreſſed by the following technical diſtich:

Arbor, ſex, ſervos, ardor, refrigerat, uſtos
Ruri cras ſtabo, nec tunicatus ero.

But as the ſeries of categories is entirely arbitrary, ſome philoſophers think all nature may be better conſidered under theſe ſeven things; ſpirit, matter, quantity, ſubſtance, figure, motion, and reſt: and others make but two categories, ſubſtance and accident.

CATENARIA, the name of a curve line, formed by a rope hanging freely from two points of ſuſpenſion, whether the points be horizontal or not. The nature of this curve was ſought after in Galileo's time; but little was done concerning it till the year 1690, when Mr. Bernouilli propoſed it as a problem to the mathematicians of Europe. This catenary is a curve of the mechanical kind, and cannot be expreſſed by a finite algebraic equation.

If you ſuppoſe a line heavy and flexible, firmly fixed to the points AB (Plate XXX. *fig.* 8.) the extremes thereof, then its own weight will bend it into the curve ACB, called the catenary, whoſe fundamental property will be this, viz. $bc : Bd :: a :$ CB, when DB, dc, are parallel to the horizon CD, perpendicular to AB, and Bb parallel to CD, and the points D and d, infinitely near to one another, and a be any given quantity. The demonſtration of this property, as alſo of many others, may be ſeen in what was publiſhed by Dr. Gregory in the year 1696: ſee alſo its conſtruction and nature by Mr. J. Bernoulli, in the Acta Eruditorum, 1691, page 277.

Mr. Cotes, in his Hærmonia Menſurarum, gives the following conciſe, and yet plain, account of the nature of the catenarian curve. Let BAC (Plate XXX. *fig.* 9.) be a very ſlender chain, or rather mathematical line, flexible throughout by any ſmall force, which can neither be extended or contracted. This ſuſpend by its ends B, C, by the force of its own weight, equally diffuſed through out all its equal particles, is ſtretched into the curve BPpAC, it is required to find any points of this curve.

If a plane be ſuppoſed to paſs through both its ends, B, and C, perpendicular to the horizon, it is evident that all the points of the propoſed curve are ſituated in this plane, and ſo that each will deſcend as low as it can. Through its loweſt point A draw AQ perpendicular to the horizon, and let PoQ drawn from any point P be perpendicular to it, and through p, being the neareſt point to P poſſible, let po be drawn parallel to AQ; call AQ $= x$, PQ $= y$, and the arch AP $= z$; then will the very ſmall lines po, oP, and pP, be to one another, as $\dot{x}$, $\dot{y}$, $\dot{z}$. Then becauſe the arch AP is ſuſtained in equilibrio, by the force of its weight, whoſe direction is parallel to the line op, by the force of the contiguous arch AC, drawing according to the direction of the tangent at A, parallel to the little line po, and by the force of the contiguous arch PB, drawing in the direction of the line pP; it is evident from mechanics, that theſe forces are to one another as op, oP, and Pp, or as $\dot{x}$, $\dot{y}$, $\dot{z}$. Therefore if the weight of the arch AP be expreſſed by its length z, and the given force drawing the arch AC, be compounded by a given length a, it will be $\dot{x} : \dot{y} :: \dot{z} : a$; and ſo $\dot{x} : \sqrt{\dot{x}\dot{x} + \dot{y}\dot{y}} = \dot{z} : \sqrt{aa + zz}$. Therefore $\dot{x} = \frac{z\dot{z}}{\sqrt{aa + zz}}$; and ſo $a + x = \sqrt{aa + zz}$; wherefore $z = \sqrt{\overline{a + x}^2 - a^2} = \sqrt{2ax + xx}$. Wherefore, if the right-line QA be continued downwards to D; ſo that Da $= a$, and the tangent AE be taken $=$ to the arch AP and DE be joined, this will be equal to DQ. Wherefore if AE, the length of any arch AP, be given; as alſo AQ, the height of the ſaid arch; there will be given AD $= a$, by joining QE and biſecting the ſame at right-angles; for the perpendicular will paſs through the point D in the line QA continued, and AD being given, we from thence can find the line AE, the length of any arch AP, whoſe altitude AQ is given, by deſcribing a circle from the center D, with the radius QA, which cuts AE in E; and theſe are the mutual relations of the parameter AD, the arch AP, and its altitude AQ. The next is to determine its breadth

and

and from what has been already advanced, we find $y = \frac{a\dot{x}}{z} = \frac{a\dot{x}}{x^{\frac{1}{2}}\sqrt{2a+x}}$, and the fluent of this laſt expreſſion will be a hyperbolic ſpace, which ſpace may be meaſured by the logarithms: ſo that PQ will be the logarithm of the ratio between DE + EA and DA, or of AP + AQ to AP — AQ, which ratio is equal to the former, when the length of the line AD is equal to *o*, 4342944819o3. So that AD being given or found as above, if any point Q be taken in the axis AQ, ſo many correſpondent points P of the curve will be had.

CATERPILLAR, *Eruca*, in zoology, the name of the butterfly-claſs of inſects, in their reptile or worm-ſtate.

It is well known that all winged inſects paſs through a reptile ſtate, before they arrive at perfection: this great change from a worm to a fly, or butterfly, was formerly eſteemed a real metamorphoſis of one animal to another; but later diſcoveries have put it beyond all doubt, that the embryo butter-fly, with all the lineaments of its parent, is contained within the external caſes, or coverings, of the caterpillar. When the included animal has acquired a ſufficient degree of ſtrength, theſe coverings are thrown off, and it appears in its genuine or moſt perfect form of a fly, or butter-fly. See FLY and BUTTER-FLY.

It is neceſſary, however, before the animal can get rid of theſe coverings, that it paſs through a ſtate of reſt, called by naturaliſts the nymph or chryſalis-ſtate. See the article NYMPH.

Whoever deſires to have a more full account of theſe animals in their reptile and chryſalis-ſtate, may conſult the ſecond volume of Reaumur's Hiſtory of inſects.

CATERPILLAR-EATERS, ſmall worms bred from the eggs of certain flies, lodged in bodies of larger caterpillars.

CATERPILLAR-SHELL, the Engliſh name of the verrucoſe turbo, with a broad and depreſſed mouth. See TURBO.

CATERPILLAR-PLANT, in botany. See the article SCORPIURUS.

CATESBÆA, in botany, a ſhrub which grows naturally in the Bahama iſlands. It riſes with a branching ſtem to the height of ten or twelve feet, which is covered with a pale ruſſet bark. The branches come out alternately from the bottom to the top, and are furniſhed with ſmall leaves like thoſe of the box-tree, coming out in cluſters round the branches at certain diſtances. The flowers, which are of a dull yellow colour, come out ſingle from the ſide of the branches, hanging downward. Each of theſe are about ſix inches long, monopetalous, and funnel-ſhaped, very narrow at their baſe, but widening upward towards the top, where it is divided into four parts, which ſpread open, and is reflexed backward. The germen is roundiſh, and when the flower is decayed, becomes an oval fleſhy berry, with one cell, containing ſeveral angulated ſeeds. This plant is raiſed here from ſeeds; but being tender, it requires a hot-houſe in this climate to preſerve it.

CATHÆRETICS, in pharmacy, the ſame with ſarcophagous medicines, or thoſe of a cauſtic nature, ſerving to eat off proud fleſh.

CATHARINE, or *Knights of St.* CATHARINE, a military order, inſtituted for the ſecurity of travellers who come to viſit the tomb of this ſaint. The knights received, as a badge of their dignity, a broken wheel with a ſword ſtained with blood. They took vows to guard the body of this ſaint, to ſecure the roads for pilgrims, to defend the rights of the church, to obey their ſuperiors in all things, and follow the rule of St. Baſil.

CATHARISTÆ, in church-hiſtory, a branch of the Manichees, ſo called from certain purifications which they were obliged to practiſe: they are alſo ſaid to have held it unlawful to eat fleſh.

CAT-HARPINGS, in naval affairs, ropes which draw in the ſhrouds parallel to the yards, that the yards may be more eaſily braced ſharp for a ſide-wind. See the articles BRACE and CLOSE-HAULED.

CATHARTICS, in medicine, remedies which promote evacuation by ſtool. They are the ſame with what are commonly called purgatives.

Cathartics may be divided into two claſſes; 1. The eccoprotic or milder. 2. The draſtic, or rougher. See ECCOPROTIC and DRASTIC.

They are likewiſe divided according as they are ſuppoſed to purge bile, pituita, melancholy, and ſeroſities, into cholagogues, phlegmagogues, melanagogues, and hydragogues. See CHOLAGOGUES, &c.

Cathartics operate by vellicating and irritating the fibres and membranes of the ſtomach and inteſtines. As the periſtaltic motion of the guts is ſuch as propels continually their contents, from the pylorus down to the rectum, every irritation either quickens that motion, in its natural order, or occaſions ſome little inverſion of it; in both, what but ſlightly adheres to the coats, or inner membranes, will be looſened and ſhook off, and carried forwards with the contents; and, being alſo more agitated, will be rendered more fluid: hence it appears how a cathartic haſtens and increaſes the diſcharge by ſtools. But the ſame manner of operation carries its effects much farther in proportion to the force of the ſtimulus; for where it is great, the appendices of the bowels, and even all the viſcera in the abdomen, will by a conſent of parts, that is, a communication of nerves, be pulled or twitched, ſo as to affect their reſpective juices, in the ſame manner as the inteſtines themſelves affect their contents. The conſequences, therefore, muſt be, that a great part will be drained back into the inteſtines, and make a part of what they

they discharge. Another way of promoting the discharges by stool, and from fusion, is to mix such particles with them as prevent their running into viscid cohesions, and by degrees divide and break them when in contact; whence they are rendered fitter to run off by the most convenient outlets.

CAT-HEAD, in naval architecture, a sort of square beam of oak, projecting like a crane over the ship's bows, so as to keep the anchor clear of the ship when it is drawing up by a tackle, the block of which is called the cat-block: the rope which passes through the several sheaves of the block is called the cat-fall.

CATHEDRA, among ecclesiastical writers, denotes a bishop's see, or throne.

CATHEDRAL, a church wherein is a bishop's see or seat.

A cathedral was originally different from what it is now, the Christians, till the time of Constantine, having no liberty to build any temple. By their churches they only meant their assemblies; and by their cathedrals, nothing more than consistories.

CATHETER, in surgery, a fistulous instrument, usually made of silver, to be introduced into the bladder, in order to search for the stone, or discharge the urine when suppressed.

The catheter may be introduced with much more ease in women than in men, as the urethra in the first is much shorter, wider, and in a straighter course.

In both sexes, however, this instrument cannot be easily passed, but by one that is previously acquainted with the anatomical structure of the parts.

To prevent repeating the operation of passing the catheter when the retention of urine will follow in a short time, modern surgeons have, instead of the common or rigid catheter, provided a flexible catheter, made of flatted silver, convoluted in a particular manner to give a continual passage to the urine.

CATHETUS, in geometry, a line falling perpendicularly on another line or surface: thus the catheti of a right-angled triangle are the two sides that include the right-angle, or more properly that side or leg which is supposed to be perpendicular to the horizon, or that which is called the perpendicular, which is always determined by its position.

CATHETUS, in architecture, a perpendicular, or plumb line, falling from the extremity of the under side of the cimatium of the Ionick capital, thro' the center of the volute: or, in other words, that which is supposed to pass directly through the middle of a cylindrical or round body, as a baluster, or column, &c.

CATHETUS *of Incidence*, in catoptrics, a right line drawn from a point of the object perpendicular to the reflecting line.

CATHETUS *of Reflection*, or *of the Eye*, a right line drawn from the eye, perpendicular to the reflecting line.

CATHOLIC, in a general sense, denotes any thing that is universal or general.

CATHOLIC CHURCH. The rise of heresies induced the primitive Christian church to assume to itself the appellation of Catholic, being a characteristic to distinguish it from all sects, who, though they had party-names, sometimes sheltered themselves under the name of Christians.

The Romish church distinguishes itself now by the name of Catholic, in opposition to all those who have separated from her communion, and whom she considers as only heretics and schismatics, and herself only as the true and Christian church. In the strict sense of the word, there is no Catholic church in being; that is, no universal Christian community.

CATHOLIC KING, a title which hath been hereditary to the kings of Spain ever since Alphonsus.

CATHOLICON, in pharmacy, a kind of soft purgative electuary, so called, as being supposed an universal purger of all humours.

CATKIN, KATKIN, the same with an amentaceous flower. See AMENTACEOUS.

CATLIN, among surgeons, a knife for cutting off corrupted parts of the body.

CATOCHE, or CATOCHUS, in medicine, a disease by which the patient is rendered, in an instant, as immoveable as a statue, without either sense or motion, and continues in the same posture he was in at the moment he was seized. The proximate cause of this disease is the immobility of the common sensory, from the time of the first attack, and therefore is an absolute rest of the blood in the brain, of the glands of the brain, and of all its emissories. This disease is generally preceded by obstinate intermitting fevers; by a dry, lean, melancholy temperament of body; by a retention of the menses and hæmorrhoids; by sudden frights; by a profound, constant, and fixed meditation on one subject. It is often cured by exciting a copious hæmorrhage from the nose; but the particular method of cure is various, according to the different causes: the patient should be excited with things that greatly strike the senses, such as light, noise, stimulating things, volatile salts, pain, friction, continual agitations, by promoting the menstrual flux, by sternutatories, and emetics, by blisters, by issues, by setons, by a moistening diet.

It seldom changes to any other disease, and sometimes it has been succeeded by an epilepsy, convulsions, madness, or an atrophy, which have ended in death.

CATOPTRICS, is that part of optics that treats of reflex vision, and explains the laws and properties of reflection, chiefly founded upon this truth, that the angle of reflection is always equal to the angle of incidence; and from thence deducing the magnitudes, shapes, and situation of the appear-

appearances of objects seen by the reflection of polished surfaces, and particularly plane, spherical, conical, and cylindrical ones.

CATOPTRIC CISTULA, a machine, or apparatus, whereby little bodies are represented large, and near ones extremely wide, and diffused through a vast space, with other agreeable phænomena, by means of mirrors, disposed by the laws of catoptrics, in the concavity of a kind of a cheſt.

Of theſe there are various kinds, accommodated to the various intentions of the artificer: ſome multiply the object, ſome deform them, ſome magnify, &c. The ſtructure of one or two will ſufficiently ſhew how an infinite variety may be made.

To make a catoptric ciſtula to repreſent ſeveral different ſcenes of objects, when looking at different foramina or poles.

Provide a polygonous ciſtula, or cheſt of the figure of the multilateral priſm A B C D E F, Plate XXX. *fig.* 10. and divide its cavity by diagonal planes E B, F C, D A, interſecting each other in the center into as many triangular locules or cells as the cheſt has ſides. Line the diagonal planes with plane mirrors; in the lateral planes make round holes, thro' which the eye may peep into the locules of the cheſt. The holes are to be covered with plane glaſſes ground within-ſide, but not poliſhed, to prevent the objects in the locules from appearing too diſtinctly.

In each locule are to be placed the different objects, whoſe images are to be exhibited; then cover up the top of the cheſt with a thin tranſparent membrane, or parchment, to admit the light properly, and the machine is compleat: for, from the laws of reflection, it follows, that the images of objects placed within the angles of mirrors are multiplied, and appear ſome more remote than others; whence the objects in one locule will appear to take up more room than is contained in the whole cheſt: therefore by looking through one hole only, the objects in one locule will be ſeen, but thoſe multiplied and diffuſed through a ſpace much larger than the cheſt: thus every new hole will afford a new ſcene. According to the different angles the mirrors make with each other, the repreſentations will be different; if they be at an angle greater than a right one, the images will be monſtrous. The parchment that covers the machine may be made pellucid by waſhing it ſeveral times in a very clear lye, then in fair water, and bracing it tight and expoſing it to the air to dry. If it be deſired to throw any colour on the objects, it may be done by colouring the parchment. Zahnius recommends verdigreaſe ground in vinegar for green; decoction of braſil wood for red, &c. He adds, it ought to be varniſhed to make it more pellucid.

To make a catoptric ciſtula to repreſent the objects within it prodigiouſly multiplied, and diffuſed through a vaſt ſpace.

Make a polygonous ciſtula, or cheſt as before, but without dividing the inner cavity into any apartments or locules, (Plate XXX. *fig.* 11.) line the lateral planes C B H I, B H L A, A L M F, &c. with plane mirrors, and at the foramina or apertures, pare off the tin or quickſilver, that the eye may ſee through; place any object in the bottom M I, as a bird in a cage, &c. Here the eye looking through the aperture *h i*, will ſee each object placed at bottom vaſtly multiplied, and the images removed at equal diſtances from one another. Hence, were a large multangular room in a prince's palace lined with large mirrors, over which were placed pellucid glaſſes to admit the light, it is evident the effect would be very ſurprizing and magnificent.

This is a very diverting and uſeful part of knowledge: the phænomena ariſing from the effects of the inſtruments that have been invented in this art are ſurprizing, even to thoſe who knew the reaſons of the phænomena they exhibit: but many of thoſe who are ignorant thereof, have thought that thoſe wonderful phænomena were produced by divination; and thoſe crafty knaves, called conjurors or cunning men, have often had recourſe to catoptric inſtruments, to help on the buſineſs of more profoundly deceiving ignorant people that came to them to foretel events.

CATOPTRIC DIAL, a dial that exhibits objects by reflected rays. See REFLECTING DIAL.

CATOPTRIC TELESCOPE, a teleſcope that exhibits objects by reflection. See the article REFLECTING TELESCOPE.

CATTLE, *Pecora*, an order of quadrupeds, for the characters of which, ſee the article PECORA.

Black CATTLE, the ſame with the ox-kind. See the article BOS.

CATUS-PARDUS, or CATUS MONTANUS, in zoology. See the article CAT *of the Mountain*.

CAVA, or VENA CAVA, in anatomy, a vein ariſing with a large ſinus from the right auricle of the heart. It there ſends out a vein to the heart itſelf, called the coronary vein, and is divided into two trunks, a ſuperior and an inferior; from the ſuperior trunk of the vena cava there ariſe the following veins; the azygos, the bronchial, the mediaſtinal, the ſuperior diaphragmatic, and the ſubclavians: the inferior trunk of the vena cava is remarkable for the valves, and from this ariſe the diaphragmatic, or inferior phrenic veins, the reinal veins, the ſpermatic, the ſacra, and the iliacs. See VEIN, and each of theſe under its proper head.

CAVALIER, in fortification, an elevation of earth, of different ſhapes, ſituated ordinarily in the gorge of a baſtion, bordered with a parapet, and cut into more or leſs embraſures, according to the capacity of the cavalier.

Cavaliers are a double defence for the faces of the oppoſite baſtion: they defend the ditch, break the beſiegers galleries, command the traverſes in dry moats, ſcour the ſaliant angle of the counter-ſcarp, where the beſiegers have the counter-batteries, and infilade the enemies trenches, or oblige them to multiply their parallels: they are likewiſe very ſerviceable in defending the breach, and the retrenchments of the beſieged, and can very much incommode the intrenchments which the enemy make, being lodged in the baſtion.

CAVALIER, in the manege, one that underſtands horſes, and is practiſed in the art of riding them.

CAVALRY, a body of ſoldiers that charge on horſeback, and may properly be called the right arm of the army: they are of great ſervice in diſturbing the enemy by their frequent excurſions, in intercepting convoys, and deſtroying the country.

The cavalry is divided into ſquadrons, and encamp on the wings of the army. Too great a number of cavalry may prove prejudicial to an army; for as they conſume a great deal of forage, they may oblige a general to decamp from an advantageous poſt.

CAVAZION, or CAVASION, in architecture, the hollow trench made for laying the foundation of a building, which, according to Palladio, ought to be one-ſixth part of the whole building.

CAUCALIS, in botany, a genus of plants, the univerſal flower of which is difform and radiated; the proper flower of the diſk is male, ſmall, compoſed of five inflexocordated equal petals; the proper flavour of the radius is hermaphrodite, and compoſed of five inflexocordated unequal petals, the exterior one being larger than the reſt and biſid: the fruit is of an oblato-oblong figure, ſtriated longitudinally, with rigid ſcabrous briſtles: the ſeeds are two, oblong, convex on one ſide and armed with prickles in order of the ſtriæ, and plane on the other ſide.

There are ſeveral ſpecies of this genus, five or ſix of which grow wild in England, and are moſt of them biennial.

CAUDA, in a general ſenſe, denotes the tail of an animal. See the article TAIL.

CAUDA DRACONIS, in aſtronomy, the dragon's tail, known by this character ☋, which is the name of the moon's deſcending node. See the article NODE.

CAUDA LEONIS, the lion's tail in aſtronomy, a ſtar of the firſt magnitude in the conſtellation leo. See the article LEO.

CAVEA, or CAVEER, or CAVIARY, the ſpawn, of hard roes of ſturgeon, made into ſmall cakes, an inch thick, and of an hand's breadth, ſalted, and dried in the ſun. This ſort of food is in great repute throughout Muſcovy, becauſe of their three Lents, which they keep with a ſuperſtitious exactneſs; wherefore the Italians ſettled at Moſcow drive a very great trade in this commodity throughout that empire, becauſe there is a prodigious quantity of ſturgeon taken at the mouth of the Wolga, and of the other rivers which fall into the Caſpian ſea. There is a pretty large quantity of this commodity conſumed in Italy; and they are very well acquainted with it in England and France, where it is reckoned no deſpicable diſh.

The French and Italians get the cavear from Archangel, but they ſeldom get it at the firſt hand, for they commonly buy it of the Engliſh and Dutch.

CAVEAT, in law, a kind of proceſs in the ſpiritual courts, to ſtop the proving of a will, the granting letters of adminiſtration, &c. to the prejudice of another. See PROBATE.

It is alſo uſed to ſtop the inſtitution of a clerk to a benefice.

CAVEATING, in fencing, is the ſhifting the ſword from one ſide of that of your adverſary to the other.

CAVEDO, in commerce, a Portugueſe long meaſure, equal to 27, $\frac{154}{1000}$ Engliſh inches.

CAVERNOSE, among anatomiſts, an appellation given to ſeveral parts of the body, on account of their ſpongy ſtructure: thus the cavernoſa corpora of the penis are two ſpongy bodies, made up of a number of ſmall caverns or cells. Theſe are the two bodies which conſtitute the penis; they ariſe diſtinct and ſeparate on each ſide of the oſſa pubis, as it were from peculiar thalami: after this they join, and, in that original ſtate, are carried into the glans. If any liquid matter be impelled into theſe, or if they be inflated, the penis becomes rigid. Theſe two bodies are alſo termed corpora ſpongioſa.

CAVESON, or CAVEZON. See the article CAVEZON.

CAVETTO, in architecture, a round concave moulding, which has a quite contrary effect to the quarter round; the workmen call it mouth, when in its natural ſituation; and throat, when turned upſide down. The cavetto is but half a ſcotia, and therefore ſhould not be confounded with it, as ſome architects do.

CAVEZON, in the manege, a ſort of noſeband, either of iron, leather, or wood, ſometimes flat, and at other times hollow or twiſted, clapped upon the noſe of a horſe, to wring it, and ſo forward the ſupplying and breaking of the horſe.

An iron cavezon is a ſemicircle or band of iron, conſiſting of two or three pieces joined by hinges, and mounted with a head-ſtall, a throat-band, and two

two ſtraps or reins, with three rings; one rein paſſes through the middle ring, when we mean to make a horſe work round a pillar; through the two ſide-rings we paſs the two reins, which the rider holds in his hand, or makes faſt to the ſaddle, in order to keep the horſe's head in ſubjection, &c.

CAVIN, in the military art, a natural hollow, fit to lodge a body of troops: if there happen to be any near a place beſieged, it is of great uſe to the beſiegers; for by the help of ſuch a place they can open the trenches, make places of arms, or keep guards of horſe, without being in danger of the enemy's ſhot.

CAUK, or CAWK, a term uſed among miners, for a coarſe ſparry ſtone, of a white colour, found in the lead-mines. See the article SPAR.

CAUL, in anatomy, a membranaceous part of the abdomen, covering the greateſt part of the guts, uſually furniſhed with a large quantity of fat, placed under the peritonæum, and immediately over the inteſtines, called by ſome authors rete, or reticulum, from the number of holes appearing in it, when raiſed, and giving it the reſemblance of a net: but it is moſt frequently called omentum. See the article OMENTUM.

CAUL is alſo a little membrane, found on ſome children, encompaſſing the head when born.

Some take this to be only a fragment of the membranes of the fœtus, which generally break at the birth of the child.

CAULICOLES, or CAULICOLI, are eight leſſer branches or ſtalks in the Corinthian capital, ſpringing out from four greater or principal cauls, or ſtalks.

The eight volutes of this order are ſuſtained by four cauls, or primary branches of leaves, and from which theſe caulicoles, or leſſer foliages ariſe.

CAULIFEROUS, an appellation given to ſuch plants as have a perfect caulis, or ſtem. See the article CAULIS.

CAULIFLOWERS, in gardening, a much eſteemed ſpecies of the braſſica, or cabbage. Theſe plants, like the cabbage, are propagated from ſeed, and are produced here in great quantities in May, June, and July, far ſuperior to thoſe raiſed in any other part of Europe; alſo conſiderable numbers are produced in autumn, which if the ſeaſon proves mild continue good till December. The ſeaſon for ſowing is the month of Auguſt, even on a particular day with ſome, generally the twentieth; for if the ſeeds are ſown a week ſooner, it is a great chance if they do not run before the proper ſeaſon for flowering, and if ſown ſo much later, they will be too ſmall at the ſeaſon for planting out. An old cucumber, or melon bed, is beſt to receive the ſeeds, lightly covering them with rich earth, obſerving to water and ſhade them in hot weather, to promote their vegetation. In about a week the plants will appear, when the coverings ſhould be taken off by degrees, for they ſhould not be expoſed to the ſun too much at firſt. In about a month after ſowing, the plants will be fit to be pricked out on another old bed, at the diſtance of about two inches, obſerving to water and ſhade them till they have got freſh root, after which too much wet ſhould be avoided, as it would greatly damage them. On this bed they may continue till the middle of October, when they ſhould be removed to where they are to ſtand the winter. Thoſe for the firſt crop are generally planted under bell or hand-glaſſes, two under each. Others are reſerved under cucumber frames, and tranſplanted in a good rich land, about the latter end of February, and ſome are placed under a ſouth wall, where, if the winter is not very ſevere, they eſcape pretty well in common. Theſe muſt be planted out in the ſpring, at about two feet and a half aſunder, which is the proper diſtance for the others.

In the month of January, it is not amiſs to ſow on a ſlight hot-bed, hardening the plants by degrees: theſe make not a bad ſubſtitute, when the others might either by running, or other accidents, have failed; but in caſe it has not ſo happened, theſe will come in after the others, whereby their ſeaſon is lengthened.

The time for ſowing cauliflower ſeeds, which are to be expected in autumn, is about the middle of May, which being tranſplanted, &c. will produce very good flowers, from Michaelmas until Chriſtmas, if the ſeaſon is favourable.

When cauliflowers begin to fruit, they muſt be carefully watched, and ſome of the inner leaves broke over them, in order to ſhade them from the ſun, which would otherwiſe turn them yellow. Some of the cloſeſt and largeſt ſhould be reſerved for ſeed, and when they ſhoot out for blowing, ſhould be faſtened to ſticks to prevent their being blown down, and when the ſeed is ripe, ſhould be cut, dried, and laid by till wanted. For the generical characters of this ſpecies, ſee the article CABBAGE.

CAULINE, in a general ſenſe, denotes any thing belonging to the caulis or ſtalk of plants. See the article CAULIS.

CAULINE LEAF, among botaniſts, that growing from the ſtalk of a plant.

CAULIS, among botaniſts, denotes the ſtalk of herbaceous plants: this, in trees, is called *caudex*, or trunk; and, in graſſes, *culmus*, or ſtem.

CAULKING, amongſt ſhipwrights, the act of driving a quantity of oakum, i. e. old ropes untwiſted and ſoftened, into the ſeams of the planks, or between them where they are joined, in order to keep out the water: after the oakum is driven very hard into theſe ſeams, it is covered with hot melted pitch, to prevent the water from rotting it.

CAUSA MATRIMONII PRÆLOCUTI, in common law, a writ that lies where a woman gives land

land to a man in fee, to the intent he ſhall marry her, and he refuſes to do it in a reaſonable time, being thereunto required by the woman: and in ſuch caſe, for not performing the condition, the entry of the woman into the lands again has been adjudged lawful.

The huſband and wife may ſue this writ againſt another who ought to have married her.

CAUSA NOBIS SIGNIFICES, in law, a writ directed to the mayor of a town, &c. who being by the king's writ commanded to make ſeiſin of lands to the king's grantee, delays ſo doing. This writ requires him to ſhew cauſe why he makes delay.

CAUSALTY, among metaphyſicians, the action or power of a cauſe in producing its effect.

It is a diſpute among the ſchool-philoſophers, whether and how the cauſalty is diſtinguiſhed from the cauſe and the effect? Some hold it a mode or modal entity, ſuperadded to the cauſe, &c. others contend for its being the cauſe itſelf. See the article CAUSE.

CAUSALTY, among miners, denotes the lighter, ſulphureous, earthy parts of ores, carried off in the operation of waſhing.

This, in the mines, they throw in heaps upon banks, which, in ſix or ſeven years, they find it worth their while to work over again. See ORE and WASHING.

CAUSE, *Cauſa*, that from whence any thing proceeds, or by virtue of which any thing is done: it ſtands oppoſed to effect. We get the ideas of cauſe and effect, ſays Mr. Locke, from our obſervation of the viciſſitude of things, while we perceive ſome qualities or ſubſtances begin to exiſt, and that they receive their exiſtence from the due application and operation of other beings. That which produces is the cauſe, and that which is produced, the effect: thus fluidity in wax is the effect of a certain degree of heat, which we obſerve to be conſtantly produced by the application of ſuch heat.

Firſt CAUSE, that which acts of itſelf, and of its own proper power or virtue: God is the only firſt cauſe in this ſenſe.

Second CAUSES, are thoſe which derive the power and faculty of action from a firſt cauſe: theſe are improperly called cauſes, in regard they do not, ſtrictly ſpeaking, act at all, but are acted on: of this kind are all thoſe that we term natural cauſes.

Philoſophers are divided as to the action whereby ſecond cauſes produce their effects: ſome maintain, that the cauſalty cannot be produced, ſince it is that which produces: others will have them to act truly by their action; but they are at a loſs ſtill about that action: ſome do not allow that corporeal ſubſtances can produce any thing but accidents: the ſyſtem of Aviſenna is, that God produces, immediately, a moſt perfect ſpiritual ſubſtance; this produces another, leſs perfect; that, a third; and thus to the laſt; which laſt produces all the corporeal ſubſtances; and thoſe corporeal ſubſtances, accidents: as to the manner of the agency, ſome maintain, that the ſubſtantial form of ſecond cauſes produces forms, and the accidental ones, accidents: others, that forms produce other forms; and others, that accidents alone are capable of producing accidents and forms.

Cauſes are diſtinguiſhed, by the ſchools, into efficient, material, final, and formal.

Efficient CAUSES are the agents employed in the production of any thing.

Material CAUSES, the ſubjects whereon the agents work, or the materials whereof the thing is produced.

Final CAUSES are the motives inducing an agent to act; or the deſign and purpoſe for which the thing was done.

Lord Bacon ſays, that the final cauſe is ſo far from being ſerviceable, that it corrupts the ſciences, unleſs it be reſtrained to human actions: however, continues he, final cauſes are not falſe, nor unworthy of inquiry in metaphyſics: but their excurſions into the limits of phyſical cauſes hath made a great devaſtation in that province; otherwiſe, when contained within their own bounds, they are not repugnant to phyſical cauſes.

Formal CAUSE, the change reſulting from the action; or that which determines a thing to be this, and diſtinguiſhes it from every thing elſe: thus, the ſoul is held the formal cauſe of man.

Cauſes are again diſtinguiſhed into phyſical and moral.

Phyſical CAUSE, that which produces a ſenſible corporeal effect; as the ſun is the phyſical cauſe of light; others define it, that which produces its effect by a phyſical virtue.

The Carteſians reſolve all phyſical cauſes into occaſional ones.

Occaſional CAUSES, therefore, are only the occaſions, not the direct cauſes of their effects. See the article OCCASION.

The ſoul, ſay theſe philoſophers, is not able to act on the body, nor the body reciprocally on the ſoul: to keep up an intercourſe between them, God, on occaſion of the motion of the body, impreſſes a ſenſation on the ſoul, and on occaſion of a ſentiment of the ſoul, impreſſes a motion on the body: the motions therefore of the ſoul and body are only occaſional cauſes of what paſſes in the one or in the other: thus, ſay they, the ſtroke or percuſſion is only the occaſional cauſe of the motion produced in the body ſtruck: it is God who is the direct efficient cauſe, &c.

Moral CAUSE, that which produces a real effect, but in things immaterial; as repentance is the cauſe of forgiveneſs. A moral cauſe is alſo defined, that which determines us, though not neceſſarily to do, or

or not to do any thing; as advice, intreaties, commands, menaces, &c.

It is to be obſerved, that in this ſenſe, a moral cauſe is only applicable to a free intelligent agent: it is alſo obſervable, that the latter notion of a phyſical, as well as a moral cauſe, is the moſt juſt, clear, and diſtinct.

Cauſes are again diſtinguiſhed into univerſal, or particular; principal, or inſtrumental; total, or partial; univocal, equivocal, &c.

CAUSE, among civilians, the ſame with action. See ACTION.

CAUSEWAY, or CAUSEY, a maſſive body of ſtones, ſtakes, and faſcines; or an elevation of fat viſcous earth, well beaten; ſerving either as a road in wet marſhy places, or as a mole to retain the waters of a pond, or prevent a river from overflowing the lower grounds.

CAUSTICS, in phyſic, an appellation given to medicines, of ſo hot and fiery a nature, that being applied, conſume, and, as it were, burn the texture of the parts like hot iron.

Cauſtics differ from cauteries, in that they perform their effects ſlower, and with leſs force and pain: they are uſed to eat off proud fungous fleſh; they alſo penetrate within hard callous bodies, and liquify the humours; and are particularly applied in abſceſſes and impoſthumations, to eat through to the ſuppurated matter, and give it vent; ſometimes alſo to make iſſues, in parts where cutting is difficult or inconvenient.

Cauſtics are generally divided into four ſorts, the common ſtronger cauſtic, the common milder cauſtic, the antimonial cauſtic, and the lunar cauſtic.

The ſtronger cauſtic is prepared, by boiling to a fourth part any quantity of the lees of almond-ſoap, adding lime, that has been kept in a veſſel pretty cloſe ſtopt for ſeveral months; the lime is a to be added till all the liquor is abſorbed, and the whole reduced to a paſte, which is to be kept in a veſſel well ſtopt.

The common milder cauſtic is prepared, by taking equal parts of ſoft ſoap, and freſh quick-lime, and mixing them at the time of uſing.

The antimonial cauſtic is prepared thus: take of antimony one pound, of corroſive ſublimate, two pounds; and being reduced ſeparately into powder, mix them well, and diſtil them in a retort with a wide neck, in a gentle heat of ſand; let what aſcends into the neck of the retort be expoſed to the air, that it may run into a liquor.

The method of preparing the lunar cauſtic is as follows: diſſolve pure ſilver by a ſand-heat, in about twice its weight of aquafortis; then dry away the humidity with a gentle fire; afterwards melt it in a crucible, that it may be poured into proper moulds, carefully avoiding over much heat, leſt the matter ſhould grow too thick.

CAUSTIC CURVE, in the higher geometry, a curve found by the concourſe or coincidence of the rays of light, reflected from ſome other curve. See CATACAUSTIC and DIACAUSTIC.

CAUSTIC GLASSES, the ſame with burning-glaſſes. See BURNING-GLASS.

CAUSUS, or BURNING-FEVER, a ſpecies of continual fever, accompanied with a remarkable inflammation of the blood. The principal ſymptoms are a heat almoſt burning to the touch, the breath extremely hot, a dryneſs of the whole ſkin, the tongue parched and rough, and an unquenchable thirſt. See FEVER.

CAUSWAY, or CAUSEWAY. See the article CAUSEWAY.

CAUTERIZATION, the application of cauteries to any part of the body. See the next article.

Cauterization with moxa is wonderfully extolled by ſome as the moſt effectual means to extirpate the gout; but it is at preſent in diſuſe, and not without reaſon; for, beſides the acute pain which it creates, it is frequently found to have little or no effect. This cauterization, however, is ſaid to be at preſent in uſe among the Arabians; and the Japoneſe and Chineſe have it in ſo great eſteem, that it makes one of their chief remedies.

CAUTERY, in ſurgery, a medicine for burning, eating, or corroding any ſolid part of the body.

Cauteries are diſtinguiſhed into two claſſes, actual and potential: by actual cauteries are meant red-hot inſtruments, uſually of iron, which are applied to many parts and diſorders: and by potential cauteries are underſtood certain kinds of corroding medicines. See the article CAUSTICS.

Cauteries have manifold uſes; for they not only deſtroy the dead parts of carious bones, remove cancers, ſchirri, excreſcencies, carbuncles, and mortified parts; but they are alſo uſed to make iſſues and ſetons, to ſtop hæmorrhages in wounds and amputations; and, laſtly, to remove an amaurоſis, epilepſy, ſciatica, with pains in the teeth and other parts.

For the right application of cauteries, various obſervations are neceſſary: 1. The ſize and figure of the cautery ſhould correſpond to that of the diſordered part. 2. It is neceſſary to ſecure the ſound parts from the cautery, to prevent giving more than neceſſary pain. 3. When the inſtrument is ſufficiently hot, it is to be applied, and ſtrongly impreſſed upon the diſordered part, till the bottom of it appears ſound. To effect this more ſpeedily, it will be neceſſary to have ſeveral cauteries in readineſs, a caution more eſpecially to be obſerved in carious bones and large hæmorrhages.

Several phyſicians have obſerved, that cauteries have ſucceeded in apoplexies, when all other remedies have failed. But for the part to which the cautery

is to be applied, there are various opinions; ſome prefer the occiput; ſome the nape of the neck, between the firſt and ſecond vertebræ; ſome the meeting of the coronal and ſagittal ſutures; and others pitch upon other parts. Miſtichellius, an Italian writer, aſſerts, that no part can be ſo proper for cauterizations in apoplexies, as the ſoles of the feet.

CAUTING-IRON, in farriery, an iron with which farriers cauterize or ſear thoſe parts of an horſe that require burning.

CAUTION, *Cautio*, in the civil and Scotch law, denotes much the ſame with what, in the law of England, is called bail. See the article BAIL.

CAUTIONE ADMITTENDA, in law, a writ which lies againſt a biſhop that holds an excommunicated perſon in priſon for contempt, after he has offered ſufficient caution or ſecurity to obey the orders of the church. On receipt of this writ, the ſheriff warns the biſhop to take caution.

CAXOU, among miners, denotes a cheſt of any ore ready prepared for refining.

CAZEMATE, or CASEMATE, in fortification, a certain retired platform in the flank of a baſtion, for the defence of the moat and face of the oppoſite baſtion. Sometimes there are three ſuch platforms one behind another, the uppermoſt of which is on the terre plein of the baſtion, which makes the other two be called *places baſſes*, or low places. They are covered from the enemy's batteries by a work of earth added to the angle of the ſhoulder, of a circular and ſometimes of a ſquare form, called ſhoulder, orillon, or epaulement. See ORILLON, &c.

It is very ſeldom that cazemates are uſed now a-days, becauſe the enemies batteries are apt to bury the cannon they contain under the ruins of their vaults; beſides that, the ſmoke with which they are continually filled, renders them inſupportable to the engineers. It is for this reaſon that the latter engineers make them open at top, contenting themſelves with fortifying them with a parapet.

CASEMATE is alſo uſed for a well with ſeveral ſubterraneous branches dug in the paſſage of the baſtion, till the miner is heard at work, and air given to the mine.

CAZERN. See the article CASERN.

CEANOTHUS, in botany, a genus of pentandrious plants, whoſe flower conſiſts of a monophyllous turbinated calyx, with five roundiſh equal petals, which ſpread open, and are leſs than the cup. It contains five erect ſubulated filaments, topped with roundiſh antheræ. The fruit is a dry berry, with three cells, each containing an ovated ſolitary ſeed.

CEDAR *of Barbadoes*. See JUNIPERUS and MAHOGONY.

CEDAR *of Bufaco*. See the article CUPRESSUS.

CEDAR *of Virginia and Bermudas*. See JUNIPERUS.

CEDAR *of Libanus*, a large coniferous tree, which puſhes out branches at the diſtance of ten or twelve feet from the ground: theſe are large and ſpreading. Its leaves are acute and ever-green, ſtanding upright. The fruit, which grows erect, are like thoſe of the pine-tree, of which it is a ſpecies; except that it is more obtuſe, and its rind thinner and ſmoother.

There are ſtill ſome cedars on mount Libanus, but in ſmall number, above and to the eaſt of Biblos and Tripoli. There are none to be ſeen any where elſe on thoſe mountains. But it is very probable that there were a great many more formerly, ſince their timber was uſed in ſo many conſiderable works. There are ſome cedars alſo growing in ſeveral parts of Africa, in the Iſle of Cyprus, and in that of Crete or Candia. Joſephus, the Jewiſh hiſtorian, aſſerts, that Solomon planted ſo large a quantity of cedars in Judea, that they were as numerous as the ſycomore-trees, which are very common in that country.

Mr. Miller obſerves, that what we meet with in the Scripture of the lofty cedars can be no ways applicable to the ſtature of this tree; ſince by the experience of thoſe we have now growing in England, as alſo from the teſtimony of ſeveral travellers who have viſited thoſe few remaining trees on Mount Libanus, they are not inclined to grow very lofty, but, on the contrary, extend their branches very far: to which the alluſion made by the Pſalmiſt agrees very well, when he is deſcribing the flouriſhing ſtate of a nation: "They ſhall ſpread their branches like the "cedar trees."

The wood of this famous tree is accounted proof againſt all putrefaction of animal bodies. This wood is alſo ſaid to yield an oil, which is famous for preſerving books and writings; and the wood is thought to continue above a thouſand years ſound. It is likewiſe recorded, that, in the temple of Apollo at Utica, there was found timber of near two thouſand years old. And the ſtatue of the goddeſs, in the famous Epheſian temple, was ſaid to be of this material alſo, as was moſt of the timber-work of that glorious ſtructure.

This ſort of timber is very dry, and ſubject to ſplit; nor does it well endure to be faſtened with nails; therefore pins of the ſame wood are much preferable.

Baſtard CEDAR, in botany, the Engliſh name of the theobroma. See the article THEOBROMA.

White CEDAR, a name given to a ſpecies of cupreſſus. See CUPRESSUS.

CEDRELA, in botany, a genus of pentandrious plants, whoſe flower is pentapelous, and funnel-ſhaped, with five ſubulated filaments, topped with oblong antheræ. The fruit is a roundiſh woody quinquelocular capſule, with five deciduous valves, and contains a number of fleſhy ſeeds.

CEDRIA, among phyſicians, the gum or reſin

which

which iſſues from the cedar. Its good qualities conſiſt in its being fat, thick, tranſparent, and that, when poured out, it falls by equal drops.

CEGINUS, in aſtronomy, a fixed ſtar of the third magnitude, in the left ſhoulder of the conſtellation Bootes. For its right aſcenſion, declination, variation, &c. ſee the conſtellation BOOTES.

CEILING, in architecture, is the lathing and plaiſtering at the top of a room, upon the underſide of the joiſts, put up for that purpoſe, and called ceiling-joiſts, if it be in a garret. Theſe plaiſtered ceilings are much uſed in England, beyond all other countries, and they have theſe conveniences with them; they make the room much lighter, are excellent againſt raging fire, they ſtop the paſſage of the duſt, and leſſen the noiſes overhead, and in ſummer-time they make the rooms ſomewhat cooler.

CELANDINE *the Greater*, *Chelidonium*, in botany, a plant with fibrous hairy roots. The leaves are of a bright green colour on the upper ſide, and bluiſh underneath; theſe are longiſh and divided to the rib into roundiſh indented portions, of which thoſe at the extremities are much larger than the others: theſe leaves contain a bright yellow juice, as does likewiſe the ſtalks, which are knotty, fiſtulous, brittle, and branched, with leaves alternately placed. The flowers are yellow and tetrapetalous, coming out in cluſters. The filaments are plain and numerous, topped by oblong, compreſſed, twin antheræ; and the fruit is a cylindraceous pod of one or two valves, containing a number of ovated, ſhining, black ſeeds. This plant flowers in May, and grows naturally in many parts of England; it is by all allowed to abound with a ſharp acrid ſalt, and is therefore recommended as a powerful aperient and attenuant: it is judged to be a ſpecific againſt the jaundice, ſcurvy, and all obſtructions and diſorders of the viſcera.

Half a dram, or a dram of the dried root in powder, or an infuſion in wine or water of a dram, or a dram and a half of the freſh root, or three or four drops of its ſaffron-coloured juice, in any convenient vehicle, are directed for a doſe; but great caution is requiſite in the internal uſe of a medicine ſo acrimonious and irritating.

Among us it is chiefly uſed by common people for ſome external purpoſes, as the deſtroying warts, cleanſing foul ſores, and removing clouds, films, and ſpecks from the eyes. For this laſt intention the juice ſhould be largely diluted in milk, it being of itſelf much too ſharp to be applied with ſafety to ſo tender an organ.

CELANDINE *the Leſſer*, or pilewort, in botany, a ſmall plant with roundiſh, ſmooth, ſhining, green leaves, ſet in long pedicles, and ſlender procumbent ſtalks, bearing bright gold coloured flowers. The root conſiſts of ſlender fibres, with a number of tubercles, or little knobs among them. It is perennial, flowers in April, and grows wild in hedges and moiſt meadows. The leaves of this plant are reckoned antiſcorbutic, and the roots are celebrated as a ſpecific againſt the piles, though perhaps without any good foundation. For the generical characters of this plant, ſee the article RANUNCULUS, of which it is a ſpecies.

CELARENT, in logic, a mode of ſyllogiſm, wherein the major and concluſion are univerſal negative propoſitions, and the minor an univerſal affirmative. As

CE No man that is a hypocrite can be ſaved:
LA Every man who with his lips only cries Lord, Lord, is a hypocrite:
RENT Therefore, no man who with his lips only cries Lord, Lord, can be ſaved.

CELASTRUS, in botany, a genus of plants, whoſe corolla conſiſts of five equal, oval, patent, ſeſſile petals, with their ends turned back: the fruit is a coloured, oval capſule, obtuſely trigonal, gibbous, formed of three valves, and containing three cells, in each of which are ſmall, oval, coloured ſeeds, ſmooth, and half covered by a calyptra, which is alſo coloured, and has an unequal rim, divided into four ſegments.

CELERIAC, in botany, a ſpecies of the apium. It differs from the common celery, by having a turnip-ſhaped root, which is the part uſed in cookery: alſo it is diſtinguiſhed by the colour of the ſtalks, which are brown; whereas thoſe of common celery are green when not blanched.

CELERY, *Apium*, in botany, a well-known plant, much uſed in ſoups, and for other culinary purpoſes, propagated by ſeeds, which ſhould be ſown at two or three different times. The firſt ſowing may be in March, on a gentle hot bed, the next in April, and the laſt ſowing in May. When the plants of the firſt ſowing are of ſufficient ſize to prick out, ſome beds of rich earth ſhould be prepared to receive them. Here they may continue until May or June, when they may be tranſplanted into trenches, (well prepared with rotten dung) where they are to perfect themſelves for uſe; theſe trenches ſhould be made about three feet aſunder, and as the plants advance in height, the earth ſhould be carefully laid up againſt them at different times, in dry weather, in order to whiten and make them more tender, obſerving not to cover their hearts. Thoſe of latter ſowing are to be managed in the ſame manner, allowing for the different time. This plant is a common winter ſallad, and much eſteemed for its generical characters. See the article PARSLEY.

CELERITY is the velocity or ſwiftneſs of any body in motion; and it is defined to be an affection of motion, by which any moveable body runs thro' a given ſpace in a given time. See VELOCITY and MOTION.

CELESTINS, in church-history, a religious order of Christians, reformed from the Bernardins by pope Celestin V. Their rules are divided into three parts; the first, of the provincial chapters, and the elections of superiors; the second contains the regular observances; and the third, the visitation and correction of the monks.

The celestins rise two hours after midnight to say mattins: they eat no flesh at any time, except when they are sick: they fast every Wednesday and Friday, to the feast of the exaltation of the Holy-cross; and from that feast to Easter, every day.

CELIAC, or COELIAC PASSION, a sort of diarrhæa, or flux of the belly, wherein the aliment comes away either crude or chylified, instead of excrements. See the article COELIAC.

CELIBACY, the state of unmarried persons, to which, according to the doctrine, or at least the discipline, of the church of Rome, the clergy are obliged.

In the church of England, the marriage of the clergy was generally practised to the end of the tenth age, and in a great measure to the beginning of the twelfth.

That celibacy has no pretence of divine or apostolical institution, seems no difficult point to prove: whence it is, at first, hard to conceive from what motive the court of Rome persisted so very obstinately to impose this institution on the clergy. But we are to observe, that this was a leading step to the execution of the project formed of making the clergy independent of princes, and rendering them a separate body, to be governed by their own laws. In effect, while priests had children, it was very difficult to prevent their dependence upon princes, whose favours have such an influence on private men; but having no family, they were more at liberty to adhere to the pope.

CELIODOGRAPHY, κηλις, a spot, and γραφω, I describe. See SUN, MOON, &c.

CELL, *Cella*, a little apartment or chamber, such as those wherein the ancient monks, solitaries, and hermits lived in retirement.

Cells are still retained in divers monasteries. Thus the dormitory is frequently divided into so many cells. The Carthusians have each a separate house, which serve them as a cell.

The hall wherein the Roman conclave is held is divided by partitions into divers cells for the several cardinals to lodge in.

CELLS are also the little divisions in honeycombs, which are always regular hexagons. See COMB.

CELLS, in botany, the hollow places between the partitions in the pods, husks, and other seed-vessels of plants. According as there is one, two, three, &c. of these cells, the vessel is said to be unilocular, bilocular, trilocular, &c.

CELLS, in anatomy, little bags or bladders where fluids or other matters are lodged, called loculi, cellulæ, &c.

CELLAR, the lowest room in a house, the arches of which are mostly level with the surface of the ground on which the house stands, or but very little higher. In ancient writers, cellar denotes the same with *cella*, viz. a conservatory of eatables or drinkables. A cellar differs from a vault, as the latter is supposed to be deeper than the vault. See VAULT.

CELOSIA, in botany, a genus of plants, the flower of which consists of five lanceolated, acuminated, erect, rigid, and permanent petals; the fruit is a globose capsule, surrounded with a corolla, with one cell opening horizontally, and containing several roundish emarginated seeds.

A species of this genus is the amaranthus coxcomb, a well-known beautiful plant; it is a native of China, and is here one of the principal ornaments of the flower-garden. As the raising and management of this differs so little from the amaranthus, we must refer the reader to that article. See AMARANTHUS.

CELSIA, in botany, a genus of plants, the flower of which is monopetalous, with a plain limb and roundish segments: the fruit is a roundish capsule, compressed at the top, acuminated, adhering to the cup, with two cells, containing several small angulated seeds.

CELTIS, the lote or nettle-tree, in botany, a genus of polygamious plants, whose flowers are male, hermaphrodite, and apetalous. The hermaphrodite consists of a monophyllous calyx, divided into five parts, and contains five short filaments topped with thick quadrangular antheræ. The fruit is a globose, unilocular drupe, including a roundish nut.

CEMENT, or CÆMENT, in the general sense, any glutinous substance capable of uniting and keeping things together in close cohesion.

Cements require to be of various compositions, and different with respect to the nature of the ingredients, according to the different manner in which they are to be applied, and the substances they are to conjoin. The kinds of cement used for common purposes pass under the denomination of glue, size, paste, and lutes. See GLUE, SIZE, PASTE, and LUTES.

CEMENTATION, or CÆMENTATION, in a general sense, the corroding of metals in a dry form, by means of the fumes of acid salts.

It is performed in the following manner. After the copper has been separated as much as possible by copelling, a stratum of salts of about half an inch in thickness is spread in the bottom of the cement-pot; over this are laid thin plates of gold, then another stratum of salts, and so on alternately, till the pot be filled within half an inch of the brim.

brim. This being done, the pot is covered up, and encompaſſed with fire, which ſhould be made gradually fiercer and fiercer; and in ſixteen or twenty hours after they have been red-hot, entirely removed, that every thing may cool by degrees. Then the pots are to be opened, the ſalts taken out, and if it is grown too hard, to be ſoftened by a ſprinkling of hot water. The plates of gold muſt be waſhed in hot water, and the water renewed, till it be free from all ſaline taſte; for the ſalts, together with the metal they have corroded, will be contained in the plates of gold. The gold muſt be tried with the touch-ſtone, or ſome more certain method, to know if it has the degree of fineneſs required; and if it is not pure enough, it muſt be cemented a ſecond time, and, if neceſſary, with ſtronger ſalts.

CEMETERY, *Coemeterium*, a place conſecrated, or ſet apart for burying the dead. See the article COEMETERY.

CENEGILD, an expiatory mulct that was formerly paid by one who killed another, to the kindred of the deceaſed.

CENOBITE, or COENOBITE. See the article COENOBITE.

CENOTAPH, *κενοταφιον*, in antiquity, a monument erected in honour of the dead, but not containing any of their remains. Of theſe there were two ſorts. One erected for ſuch perſons as had been honoured with funeral rites in another place; and the ſecond ſort, for thoſe that had never obtained a juſt funeral.

The ſign whereby honorary ſepulchres were diſtinguiſhed from others, was commonly the wreck of a ſhip, to denote the deceaſe of the perſon in ſome foreign country.

CENSER, a ſacred inſtrument made uſe of in the religious rites of the ancients. It was a vaſe, containing incenſe to be uſed in ſacrificing to the gods. There is the repreſentation of one in Montfaucon's Antiquities, under the figure of a ſhallow cup with a lid to it, and chains running through ſmall handles. Cenſers were likewiſe in uſe among the Jews, as we find in 1 Kings vii. 50. "Solomon, when "he prepared furniture for the temple of the Lord, "among other things made cenſers of pure gold." The cenſer is alſo uſed in Romiſh churches.

CENSOR, in Roman antiquity, a magiſtrate, whoſe buſineſs it was to reform the manners, and to value the eſtates of the people.

There were two cenſors firſt created in the 311th year of Rome, upon the ſenate's obſerving that the conſuls were generally ſo much taken up in military actions, as to have no leiſure to attend to private affairs. At firſt they were choſen out of the ſenate, but after the plebeians had got the conſulate open to them, they ſoon arrived at the cenſorſhip. The cenſors degraded ſenators upon occaſion, made the *princeps ſenatus*, inſpected the management of private families, relating to education and expence; and, in ſhort, had authority to reprimand and correct any irregularity, and to take care that perſons, both in public and private capacity, behaved themſelves in a becoming manner. Cicero reduces their functions to the numbering of the people, the correction and reformation of manners, the eſtimating the effects of each citizen, the proportioning of taxes, the ſuperintendence of tribute, the excluſion from the temples, and the care of the public places.

The office was ſo conſiderable, that none aſpired to it till they had paſſed all the reſt; ſo that it was looked on as ſurpriſing, that Craſſus ſhould be admitted cenſor, without having been either conſul or pretor. It was held at firſt five years; but Mamercus Æmilius ſhortened the term to eighteen months.

After the cenſors were elected in the comitia centurialia, they proceeded to the Capitol, where they took an oath not to manage either by favour or diſaffection, but to act equitably and impartially through the whole courſe of their adminiſtration: and notwithſtanding their great authority, they were obliged to give an account of their management to the tribunes and ædiles curules. In proceſs of time, the dignity of this office dwindled very much; under the emperors it ſunk to nothing, as their majeſties engroſſed all the branches of that juriſdiction. The republic of Venice has at this day a cenſor of manners of their people, whoſe office laſts ſix months.

CENSORS *of Books* are a body of doctors or others eſtabliſhed in divers countries to examine all books before they go to preſs, and to ſee they contain nothing contrary to faith and good manners.

CENSURE, a judgment which condemns ſome book, perſon, or action, or more particularly a reprimand from a ſuperior. Eccleſiaſtical cenſures are penalties by which, for ſome remarkable miſbehaviour, Chriſtians are deprived of the communion of the church, or prohibited to execute the ſacerdotal office.

CENSUS, among the Romans, was an authentic declaration, made by the ſeveral ſubjects of the empire, of their reſpective names and places of abode, before proper magiſtrates in the city of Rome, called cenſors, and in the provinces cenſitors, by whom the ſame were regiſtered.

This declaration was accompanied with a catalogue, or enumeration, in writing, of all the eſtates, lands, and inheritances they poſſeſſed; their quantity, quality, place, wives, children, tenants, domeſtics, ſlaves, &c.

The cenſus was inſtituted by king Servius, and was held every five years. It went through all the ranks of people, though under different names: that of the common people was called cenſus, or luſtrum; that of the knights, cenſus, recenſio, recognitio; that of the ſenators, lectio, relectio.

Hence, alſo, cenſus came to ſignify a perſon who had

had made such a declaration; in which sense it was opposed to incensus, a person who had not given in his estate or name to be registered.

The census among the old Romans was held, as is commonly thought, every five years; but this must not be taken to be precisely true: on the contrary, Dr. Middleton has shewn, that both the census and lustrum were, for the most part, held irregularly and uncertainly, at very different and various intervals of time.

The census was an excellent expedient for discovering the strength of the state: by it they learned the number of the citizens, how many were fit for war, and who for offices of other kinds; how much each was able to pay of taxes towards the charge of the war.

The census, according to Salmasius, was peculiar to the city of Rome. That in the provinces was formerly called professio; but this distinction is not every where observed by the ancients themselves.

CENT, from centum, a hundred, used in commerce, to express the profit, loss, interest, brokerage, &c. Thus, a merchant, or tradesman, we say, gained five, ten, or twenty per cent. by such a commodity, which means nothing more, than that he gained five, ten, or twenty pounds by every hundred pounds he laid out in that commodity. Likewise, when a person lends out a sum of money upon interest, it is usual to say, he has lent it out at five per cent. &c. which is nothing more than that the lender is to receive five pounds per year for every hundred pounds he lends, and in proportion for any other quantity. Again, when we employ a broker, factor, &c. to negociate any business, &c. it is usual to allow such factor, or broker, a fee or perquisite of one-eighth per cent. one-fourth per cent. &c. according to agreement; which signifies, that the broker is to receive one-eighth of a pound, viz. 2 s. 6 d. for every hundred pounds he negociates on your account, &c. We likewise say, the exchange of such a country is so much per cent. Thus we may say, the exchange at Barbadoes at present is thirty-five per cent. which means, that the currency of that island differs from sterling thirty-five pounds in the hundred.

CENTAUR, or HIPPOCENTAUR, in ancient poetry, denotes a fabulous kind of animal, half man, half horse.

The Thessalians, who first taught the art of breaking horses, appearing on horse-back to make only one body with the animal on which they rode, gave rise to the fiction of the hippocentaur.

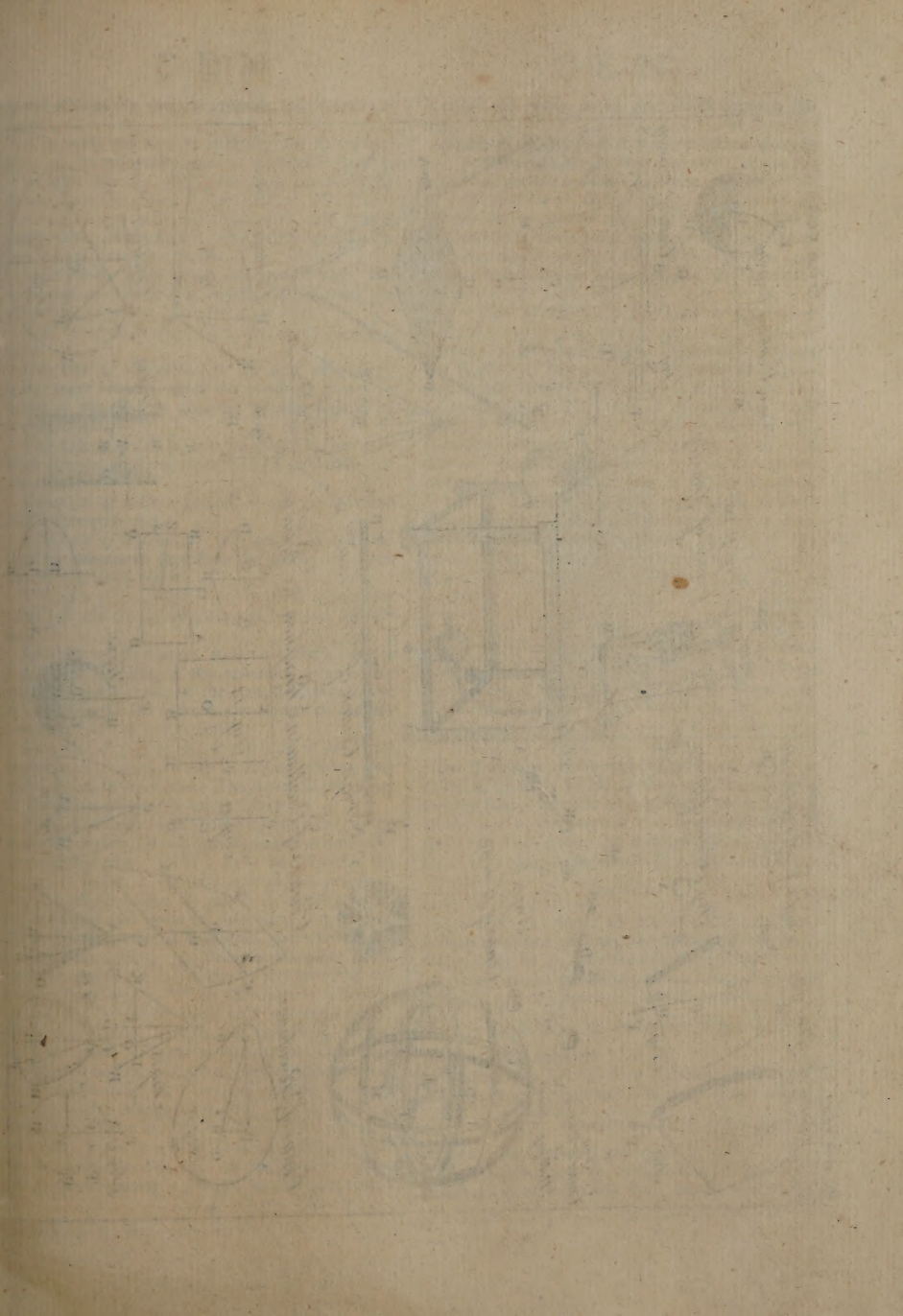
CENTAUR, or *Centaurus*, in astronomy, a constellation of the southern hemisphere near the Wolf, and by some joined with the Wolf, and called *Centaurus cum Lupo*, but we shall give them separate. In fabulous history we have various opinions with regard to this constellation. Some will have it to be Typhon; others Chiron, the schoolmaster of those three excellent men, Hercules, Achilles, and Æsculapius: unto Hercules he read astronomy, to Achilles music, and to Æsculapius physic, and for his upright life, they say, was turned into this constellation. However, Virgil calls Sagittarius by the name of Chiron, and we rather think it is that sign into which Chiron is translated. Near the hind feet of this constellation are four stars, forming by their position a cross, and by sailors are called the Crosiers; these are not visible in England, nor are many of those in the Centaur. The five below are all that have been observed with any accuracy at the Observatory, though there are more that rise above our horizon, yet they are so small, and it is commonly so hazy in this climate near the earth, that they become invisible.

Order.	Magn.	Name.	Bayer. Let.	Right Ascension.	Distance from Nor. Pole.	Var. in Right Ascen.	Var. in Declination.
				° ′ ″	° ′ ″	″	″
1	4.5		*i*	202.59.59	121.48.56	48.2	18.8
2	4.5		*g*	203.51.57	123.14.30	48.7	18.7
3	4.5		*k*	204.28.39	121.47.33	48.7	18.0
4	4.5		*h*	204.50. 0	120.43.46	48.5	17.8
5	2.3		*θ*	208. 8.38	125. 9. 4	50.2	17.5

CENTAURIUM *Majus*, great centaury, in botany, a large plant, with the leaves composed of oblong serrated segments set in pairs on a middle rib, which is edged, in the intermediate spaces, with a serrated margin: the stalk divides, towards the upper-part, into several branches, bearing on the tops round soft scaly heads, from which come forth bluish flosculi, followed by down inclosing the seeds. It is perennial, a native of the southern parts of Europe, and raised with us in gardens.

The root of this plant, of a dark blackish colour on the outside, is internally reddish, and yields, when fresh, a juice of a deep red. It has a slight smell, not agreeable; and in chewing discovers a viscous sweetness and roughness, with some degree of acrimony. It is reckoned aperient and corroborant, and supposed to be particularly useful in alvine fluxes; in which intention it has by some been greatly recommended, though apparently much inferior to the root, whose place it was employed to supply, to wit, the true rhapontic. Among us it has long stood discarded from practice, and is now dropped by the colleges both of London and Edinburgh.

CENTAURIUM *Minus*, lesser centaury, in botany, a small plant, with three-ribbed, somewhat oval leaves, set in pairs on the stalks; which divide, towards the top, into several branches, bearing umbel-like clusters, of bright red, funnel-shaped flowers, cut into five acute segments, followed by little oblong capsules full of very small seeds. It is annual, grows



Center of Gravity

Fig. 1.

Fig. 2.

Fig. 3. Center of Gravity.

Fig. 4. Center of Gravity.

Fig. 5. Center of Gravity.

Fig. 6. Center of Gravity

Fig. 7. Center of Gravity.

Fig. 8. Center of Gravity or Rolling Lamp.

Fig. 9. Center of Gravity.

Fig. 10. Center of Gravity.

Fig. 11. Center of Percussion

Fig. 23.

Center of Percussion.

Fig. 12.

Centers of Oscillation, Percussion, & Pressure.

Fig. 13.

Fig. 14.

Fig. 15.

Fig. 16.

Central Force.

Fig. 26.

Fig. 17.

Fig. 18.

Fig. 19.

Fig. 20.

Fig. 21.

Fig. 22.

Central Force.

Fig. 25.

Fig. 27.

grows wild in dry pasture grounds, and flowers in July.

The leaves and tops of centaury are strong bitters, of scarcely any smell or particular flavour. The seeds also are very bitter; the petala of the flowers, and the roots, almost insipid. The flowery tops are generally made choice of, and are of considerable estimation in the present practice as corroborant stomachic bitters.

CENTER, or CENTRE, in a general sense, signifies that point which is equally distant from the extremities of a line, superficies, or solid.

The word is formed from the word κεντρον, a point.

CENTER *of Attraction*, in the new astronomy, is that point towards which the revolving planet or comet is impelled or attracted by the impulse of gravity.

CENTER *of a Circle*, is a point within the same, from whence all lines drawn to the circumference are equal.

CENTER *of a Conic Section*, is the point where all the diameters meet.

CENTER *of a Dial*, is that point in the dial where a line drawn parallel to the axis of the earth intersects the dial planes.

CENTER *of an Ellipse*, is that point where the transverse and conjugate diameters intersect each other.

CENTER *of the Equant*, in the old astronomy, is a point in the line of the aphelion, being so far distant from the center of the eccentric towards the aphelion, as the sun is from the center of the eccentric towards the perihelion.

CENTER *of gravity* is that point about which all the parts of a body, in any situation, balance each other, or are in equilibrio. The particular properties of the center of gravity are as follow:

First, If a body be suspended by this point, as the center of motion, it will remain at rest in any position indifferently. 2. If a body be suspended by any other point, it can rest only in two positions, viz. when the center of gravity is exactly above or below the said point of suspension. 3. When the center of gravity is supported, the whole body is kept from falling. 4. Because this point has a constant endeavour to descend to the center of the earth; therefore, 5. When the point is at liberty to descend, the whole body must descend, or fall either by sliding, rolling, or tumbling down. 6. The center of gravity in regular, uniform, homogenial bodies, as squares, circles, spheres, &c. is the midle point in a line, connecting any two opposite points or angles. 7. In a triangle, it is in a line, drawn from any angle bisecting the opposite, one third of the length of that line, distant from the side, or base bisected. 8. In human bodies, the center of gravity is situated in that part which is called the pelvis, or in the middle between the hips.

Hence the solutions of many very curious phœnowill be evident, with the least attention; and as the center of gravity is of the greatest consequence to be well understood, being the sole principle of all mechanical motion, it may not be amiss to shew the method of finding that point in any line, figure, or body, which we shall first do theoretically, and then a few examples of performing the same mechanically.

Let MN (Plate XXX. *fig.* 10.) be any figure or solid body, regular or irregular; C it's center of gravity; and suppose it to be suspended in C upon the horizontal line SC, and the axis of suspension to pass through S, parallel to the horizon and perpendicular to SC. Let all the infinitely small particles of the body be reduced to the line SC, situated respectively in planes perpendicular to SC; and let the magnitude of every two particles of the body taken on different sides of C (as a and g, b and h, d and i, &c.) be reciprocally as their distances from C; then is C still the center of gravity of each corresponding two, as it is of the whole MN. Therefore we have $Ca \times a = Cg \times g$, that is $\overline{SC - Sa} \times a = \overline{Sg - SC} \times g$, or $\overline{a+g} \times SC = Sa \times a + Sg \times g$. In like manner $\overline{b+h} \times SC = Sb \times b + Sh \times h$, and $\overline{d+i} \times SC = Sd \times d + Si \times i$, &c. whence $\overline{a+b+d+e+g+h+i+k} \times SC = Sa \times a + Sb \times b, + Sd \times d + Se \times e + Sg \times g + Sh \times h + Si \times i + Sk \times k$, &c. consequently $SC = \frac{Sa \times a + Sg \times g + Sb \times b + Sh \times h \text{ \&c.}}{a + g + b + h \text{ \&c.}}$. Now if any one of the variable distances, as Sb be called x, the body MN, s; then will $Sb \times b = xs$, and the sum of all the $Sa \times a + Sb \times b$ &c. = sum of all the xs, or the fluent of xs: and the sum of all the $a + b + g$ &c. = sum of the s, or the fluent of s that is the body MN; therefore $SC = \frac{\text{fluent of } xs}{\text{body MN or } s}$. Therefore

To find the center of gravity; let s = line, surface or solid: multiply the fluxion of the line, surface, or solid (s) by the distance (of the center of gravity of the generating point, line, or plane) from the axis of suspension; and find the fluent z; then $\frac{z}{s}$ = distance of the center of gravity from the point of suspension.

Example I. Let SB be a right line or cylinder, S the point of suspension; $SB = x$; then $\dot{z} = x\dot{x}$, and $z = \frac{1}{2}xx$; therefore $\frac{z}{s} = \frac{1}{2}x$, for the distance of the center of gravity SC.

Example II. In the triangle SQD, (*fig.* 12.) whose point of suspension is S; let SF bisect the

oppoſite ſide QD, then the center C is in the line SF; draw AE parallel, and SG perpendicular to QD, put SF $= a$, SB $= x$, SI $= v$, SG $= b$, QD $= b$, AE $= y$. By ſimilar triangles $v = \frac{bx}{a}$, and $\dot{v} = \frac{b\dot{x}}{a}$, $y = \frac{bx}{a}$; then $\dot{z} = x\,y\,\dot{v} = \frac{bbx^2\dot{x}}{aa}$; and $z = \frac{bbx^3}{3aa}$. Alſo $\dot{s} = y\dot{v} = \frac{bbx\dot{x}}{aa}$, and $s = \frac{bbx^2}{2aa}$: Therefore $\frac{z}{s} = \frac{2}{3}x$, and when $x = a$, $\frac{z}{s} = \frac{2}{3}a =$ SC.

Example III. Let AM (*fig.* 13.) be the arch of a circle, s its center, AD $= b$, SE $= r$, SB $= x$, AM $= v$, BM $= y$. It is evident the center of gravity of any arch AEG is in the line SE that biſſects it. Whence $\dot{z} = x\dot{v} =$ (by the nature of the circle) $= r\dot{y}$; and $z = ry$; and the fluent corrected is $z = by - ry$. Whence $\frac{z}{s} = \frac{rb - ry}{v}$, and when $y = 0$, $\frac{z}{s} = \frac{rb}{v} =$ SC, the diſtance of the center of gravity of the arch AEG from S.

Example IV. For the ſector of a circle MmS, (*fig.* 14.) whoſe center and point of ſuſpenſions S; let arch M$m = c$, radius SM $= r$, M$m = a$, SQ $= x$, QD$q = v$. Then Q$q = \frac{ax}{r}$, and by the laſt example, the diſtance of the center of gravity of the arch QDq from S is $= \frac{ax^2}{rv}$, therefore $\dot{z} = \frac{ax^2\dot{x}}{r}$, and $z = \frac{ax^3}{3r}$; therefore $\frac{z}{s} = \frac{ax^3}{3r \times \frac{1}{2}xv} = \frac{2ax^2}{3rv} = \frac{2ax}{3c}$; and when $x = r$, then SC $= \frac{2ar}{3c}$.

Example V. For the circular area PQD, (*fig.* 15.) Let SD or SE $= r$, SQ $= b$, PQ $= c$, SB $= x$, PA $= v$, AB $= y$, by the nature of the circle $y = \sqrt{rr - xx}$; then $\dot{z} = yx\dot{x} = x\dot{x}\sqrt{rr - xx}$, and $z = -\frac{1}{3} \times \overline{rr - xx}^{\frac{3}{2}}$; corrected $z = \frac{\overline{rr - bb}^{\frac{3}{2}} - \overline{rr - xx}^{\frac{3}{2}}}{3} = \frac{c^3 - y^3}{3}$. Alſo $s =$ area PABQ $= \frac{vr \times xy - cb}{3}$; $= \frac{c^3 - y^3}{3}$. Alſo $s =$ area PABQ $= \frac{vr + xy - cb}{2}$; whence $\frac{z}{s} = \frac{2}{3} \times \frac{c^3 - y^3}{vr + xy - cb} =$ Sc. And the diſtance of the center of gravity of the whole PADQ from S is $= \frac{2c^3}{3vr - 3cb}$.

Again in reſpect of the axis of ſuſpenſion SD; ſince the center of gravity of the deſcribing line y, is in the middle of BA, therefore $\dot{z} = \frac{1}{2}y \times y\dot{x} = \frac{rr\dot{x} - x^2\dot{x}}{2}$, whence $z = \frac{r^2x}{2} - \frac{x^3}{3}$. But (in Q, $x = b$, $z = 0$) the fluent corrected is $z = \frac{3rrx - 3rrb - x^3 + b^3}{6}$; therefore $\frac{z}{s} = \frac{1}{3} \times \frac{3r^2x - 3r^2b - x^3 + b^3}{vr + xy - cb}$; and when $x = r$, $\frac{2r^3 - 3r^2b + b^3}{3rv - 3cb} =$ diſtance of the center of gravity of the ſemi-ſegment PADQ from QD.

Example 6. In the parabola $rx = yy$, (*fig.* 16.) let SP $= x$, PM $= y$, then in reſpect of the axis of ſuſpenſion ST, $\dot{z} = yx\dot{x} = x\dot{x}\sqrt{rx}$; and $z = \frac{2}{3}xx\sqrt{rx}$: and $s = \frac{2}{3}xy = \frac{2}{3}x\sqrt{rx}$; therefore $\frac{z}{s} = \frac{3}{5}x$ the diſtance of the center from ST.

Again in regard to the axis of ſuſpenſion SP, becauſe the center of gravity of the deſcribing line is in the middle of MP, therefore $\dot{z} = \frac{1}{4}yy\dot{x} = \frac{y^3\dot{y}}{r}$, and thence $z = \frac{y^4}{4r}$; and $s = \frac{2y^3}{3r}$: Therefore $\frac{z}{s} = \frac{3}{8}y$, the diſtance from SP.

Example VII. For the hyperbolic area BCMP, (*fig.* 17.) between the aſymptotes. Let SP $= b$, BC $= c$, SP $= x$, PM $= y$, $cb = xy$. Then in regard to the axis SD, $\dot{z} = yx\dot{x} = cb\dot{x}$, and $z = cbx$, but in B, $x = b$, therefore by correction $z = cb \times x - \overline{b}$. And $\frac{z}{s} = \frac{cb \times \overline{x - b}}{\text{area BCMP}}$.

Again for the axis of ſuſpenſion SP, $\dot{z} = \frac{1}{2}yy\dot{x} = \frac{ccbb}{2xx}\dot{x}$, and $z = \frac{-ccbb}{2x} = \frac{-cby}{2}$; corrected $z = \frac{cb}{2} \times \overline{c - y}$ and $\frac{z}{s} = \frac{cb \times \overline{c - y}}{2 \text{ area BCMP}}$.

Example VIII. Let AMB (*fig.* 18.) be an ellipſis, S the center, AS $= a$, SB $= b$, SQ $= y$, QM $= x = \frac{a}{b}\sqrt{bb - yy}$, then for the elliptic ſpace, $\dot{z} = xy\dot{y} = \frac{ay\dot{y}}{b}\sqrt{bb - yy}$; and $z = -\frac{a}{3b} \times \overline{bb - yy}^{\frac{3}{2}}$, corrected $z = \frac{abb}{3} - \frac{a}{3b} \times \overline{bb - yy}^{\frac{3}{2}}$: Thence $\frac{z}{s} = \frac{ab^3 - a \times \overline{bb - yy}^{\frac{3}{2}}}{3b \times \text{area SAMQ}}$.

Likewiſe for the diſtance from SB, $\dot{z} = \frac{1}{2}xx\dot{y} = \frac{aa\dot{y}}{2} - \frac{aay^2\dot{y}}{2bb}$, and $z = \frac{ayy}{2} = \frac{aay^3}{6bb}$; whence $\frac{z}{s} = \frac{3bba^2y - aay^3}{6bb \times \text{area SAMQ}}$.

Example IX. Let SMP (*fig.* 16.) be the hyperbolic ſpace, tranſverſe $= 2a$, conjugate $= 2b$, SP $= x$, PM $= y = \frac{b}{a}\sqrt{2ax + xx}$,

whenc

whence $\dot{x}x = 2aa + \frac{aa}{bb}yy - \frac{2aa}{b}\sqrt{bb+yy}$, $\dot{x}\dot{x} = \frac{aa}{bb}y\dot{y} - \frac{aay\dot{y}}{b\sqrt{b+yy}}$; whence $\dot{z} = y\dot{x}\dot{x} = \frac{aa}{bb}y^2\dot{y} - \frac{ayy^2\dot{y}}{b\sqrt{bb+yy}}$, and $z = \frac{aay^3}{3bb} - \frac{aay}{2b}\sqrt{bb+yy} + \frac{aab}{2} \times 2.30258 \log. y + \sqrt{bb+yy}$:, whence $\frac{z}{s} = \frac{z}{\text{area SMP}}$ = distance from ST.

Then for the distance from SP, we have $\dot{z} = \frac{yy\dot{x}}{2} = \frac{bb\dot{x}}{2aa} \times \sqrt{2ax + xx}$, and the fluent $z = \frac{bbxx}{2b} + \frac{bbx^3}{6aa}$; therefore $\frac{z}{s} = \frac{3abbxx + bbx^3}{6aa \times \text{area SPM}}$.

Example X. For the surface of a right cone, (*fig.* 19.) let $SD = f$, c = circumference of the base, axis $SB = d$, $SM = v$, $SF = x$. Then it is plain it's center of gravity is in the axis SB. $\frac{cx}{d}$ = circumference of the circle MQ; and by similar triangles $v = \frac{fx}{d}$; therefore $\dot{z} = \frac{cx^2v}{d} = \frac{cfx^2x}{dd}$; and $z = \frac{cfx}{3dd}$; also $s = \frac{cxv}{2} = \frac{cfxx}{2dd}$: therefore $\frac{z}{s} = \frac{2}{3}x = SC$.

Example XI. For the cone (or pyramid) SDE, (*fig.* 19.) let the base $= b$, the rest as in the last example; then the circle $MQ = \frac{bxx}{dd}$; and $\dot{z} = \frac{bx^3\dot{x}}{dd}$, and $z = \frac{bx^4}{4dd}$; also $s = \frac{bx^3}{3dd}$: therefore $\frac{z}{s} = \frac{3}{4}x = SC$ the distance of the center of gravity from S.

Example XII. Let SMD (*fig.* 20.) be a sphere, $SP = y$, radius $= r$, $c = 3.1416$, then $y = \sqrt{2rx - xx}$, and $\dot{z} = cy^2x\dot{x} = 2crx\dot{x}x - cx^3\dot{x}$; therefore $z = \frac{2crx^3}{3} - \frac{cx^4}{4}$: and $s = crx^2 - \frac{cx^3}{3}$; therefore $\frac{z}{s} = \frac{8rx - 3xx}{12r - 4x}$ for the distance of the center of gravity from S.

Example XIII. For the spheroid SMD, (*fig.* 20.) whose center is C, let $SC = a$, $CF = b$, $SP = x$, $PM = y$, $c = 3.1416$, then $yy = \frac{bb}{aa} \times \sqrt{2ax - xx}$; and $\dot{z} = cyyx\dot{x} = \frac{cbb}{aa} \times \sqrt{2axx - x^2x}$; and $z = \frac{cbb}{aa} \times \sqrt{\frac{2}{3}ax^3 - \frac{1}{4}x^4}$; and $s = \frac{cbb}{aa} \times \sqrt{ax^2 - \frac{1}{3}x^3}$; and $\frac{z}{s} = \frac{8ax - 3xx}{12a - 4x}$.

Example XIV. To find the center of gravity of the solid SBDm, (*fig.* 21.) generated by a partial revolution of the parabola SMD about the axis SB. Let s be the point of suspension, let $SB = d$, $BD = b$, $SP = x$, $PM = y$, $ax = yy$, arch $Dd = c$; then arch $Mm = \frac{cy}{b}$; therefore $\dot{z} = \frac{cyy}{2b}x\dot{x} = \frac{cax^2\dot{x}}{2b}$; and $z = \frac{cax^3}{6b}$: and $s = \frac{cax^2}{4b}$, therefore $\frac{z}{s} = \frac{2}{3}x$, the distance from ST.

Example XV. Let the hyperbola CM (*fig.* 22.) revolve round the asymptote SP, and describe an hyperboloid CMB: let $SB = b$, $BC = d$, $SP = x$, $PM = y$, $c = 3$, 1416. $bd = xy$; and $\dot{z} = cyyx\dot{x} = \frac{bbddc\dot{x}}{x}$, whence $z = bbddc$ log. x: and corrected $z = bbddc$ log. $\frac{x}{b}$: also $\dot{s} = cyy\dot{x} = \frac{cbbdd\dot{x}}{x\dot{x}}$; and $s = \frac{cbbdd}{x}$, and corrected $s = cbbdd \times \frac{x-b}{bx}$; therefore $\frac{z}{s} = \frac{bx}{x-b} \times \log. \frac{x}{b}$ = distance of the center of gravity of the solid from SA.

To find the center of gravity of bodies mechanically. First let AB (Plate XXXI. *fig.* 1.) be a body whose center of gravity is to be found. If it be suspended by any part, as A, so as to move freely on the pin at A, and a plumb-line AP hangs from the same pin, its center of gravity must be under, or rather behind that line, because it will fall below the center of motion A. Let the line AB, (*fig.* 2.) be marked upon the body as in figure, and then suspend the body of any other part, as F, provided that the center of motion be not in the line AB, hang on the plummet at F, and the line FD under the plum-line, FP will cut the line AB, and shew the center of gravity to be at C; for since it must be both in the AB, and in the line FD, it can only be in the point C, where they intersect.

Let it be remarked, that we have not here considered the thickness of the body; but if we suppose it a piece of board, as the figure represents; then we must only make the experiment on the other side, and as we shall find another point C, just opposite to the first point C. The line which joins these two points is called the axis of gravity, and the middle of that line the center of gravity.

Any body that we consider in mechanics, is only an aggregate of several other bodies or parts; so that the center of gravity of a body, is only the common center of gravity of all the parts; and

consequently several bodies are united in any machine; or if there be any combination of bodies to be sustained, regard is no longer had to the particular centers of gravity of the several bodies which make up the compound, but only to the common center of gravity of the whole. Thus a windmill must be supported under the common center of gravity of all its parts, and its line of direction must fall along the axis of the post round which it moves: and crane upon a wharf, or a dock, where the whole machine turns round, must have the line of direction in its axis.

Let the line A B, *fig.* 3, present an even rod or wire, divided into two equal parts at the point C, its center of gravity will be at C; and if two equal bodies, equally heavy, be thrust on at each end, so as to have their centers of gravity at the same distance from C, they will be in equilibrio at the said point C, which will then become the common center of gravity, and continue so, whether the bodies approach nearer to, or recede farther from it, in proportion to their masses. The same will happen if the bodies are unequal, as A and *b*, *fig.* 4, whose masses are to each other as two and one, provided that the greater body be at A, twice as near to the common center of gravity *c*, than the lesser body *b*. And *c* will be the center of gravities of those bodies, though they should move to immense distances from each other, provided their distances from the said point *c*, are reciprocally as their masses, as we said before.

So that when two bodies approach towards, or recede from each other, with velocities reciprocally proportionable to their masses, their center of gravity will remain at rest. And if the bodies being made fast upon the wire, the center of gravity be sustained on a pivot, how swift soever the bodies be made to turn round the center of gravity, and each other, the center of gravity will remain at rest, and the bodies will describe similar circles about it and each other, as in the figure, the one never overpowering the other. If they be carried forward in any manner by any external force acting upon them, in proportion to their masses, their centers of gravity will go forward uniformly in a right line, and move just as if the two bodies were united in one at the said center. And if they be projected, their center of gravity will move in the same curve as projectiles do, whether in their motion they turn round each other, or not. This is evident in the motion of an arrow, of a chain-shot, or bar-shot, and of a stick thrown from the hand, the center of gravity of any of those bodies moving in the same manner as a single ball would do. So the moon and earth, in their motion round the sun, do neither of them describe the *magnus orbis*; but their common center of gravity describes it in the same manner that they would do if they were both united in that point, or in the same manner that the earth alone is supposed to do it, when these inequalities of motion are overlooked; and provided that their distances from the common center of gravity be reciprocally proportionable to their masses, their distances from each other may be greater or less in any proportion. If there were no other bodies in our system but the earth and moon turning round each other, their center of gravity would always remain at rest.

But since the large body of the sun, by the power of attraction, commands the earth and moon to revolve about itself, it will follow, that the point *c*, (*fig.* 5.) (supposing A the earth, and B the moon) is that which must describe the *magnus orbis* about the sun, because no other point between A and B can keep at the same distance from the sun, on account of the mutual revolution of those bodies about that point, at the same time they are carried about the sun.

But to illustrate this farther, let S (Plate XXXI. *fig.* 5.) be the sun, and C D E F, a part of the earth's annual orbit, A and B the earth and moon in her conjunction at C, in her quadrature at D, in her opposition at E, and in her last quarter at F. During all these motions from C to F, it is evident that the center of the earth describes an irregular curve A D A F, but the center of the moon one, much more so, as being at very unequal distances from the sun S, continually increasing and decreasing, and that the point C is that alone which is at an equal distance at all times, and therefore describes the circular orbit about the sun.

If three or more bodies united to, or acting upon one another, in any manner proportionable to their masses, be carried about their common center of gravity, that point will be at rest for the same reason, as it will happen in respect of two bodies; because any number of bodies may, in this respect, be reduced to two. Thus, in our system, where the sun and our planets move round their common center of gravity, that center is at rest in the middle of the system. Though we commonly consider the sun as immovable in the middle of the system, because as it has vastly more matter than all the planets together, that center will be always very near the sun's center; which may easily be found by comparing their quantity of matter and distances, thus. Let A B C (*fig.* 6.) represent the sun's body on I its center. Now since the bulks and distances of the four first planets, viz. Mercury, Venus, the Earth, and Mars, are very inconsiderable in regard of the sun, they would not, if placed in the right line C G, remove the common center of gravity between the sun and themselves far from the center of the sun suppose to L. But when we come to Jupiter, his bulk and distance give him a considerable momentum, which well, if placed in the same line C G, remove the center of gravity from from L to I, a point without the

the ſurface of the ſun's body. Laſtly, if we conſider Saturn placed in the line C G, with all the reſt, his momentum from his great diſtance and bulk, will be conſiderable enough to bring the common center of gravity from I to H, at ſuch a diſtance C K, from the ſun's ſurface as is equal to eight-tenths of the ſun's ſemidiameter S C, or S C : C K :: 10 : 8. Now it is this point K, which is the fixed and immovable center of the ſyſtem, about which the ſun as well as all the planets move. Thus we ſee the center of gravity of any body, or ſyſtem of bodies, is not within the body itſelf, or any one of the combined bodies; yet we are to have the ſame regard to its ſupport, deſcent, or motion, in any direction, as if it was.

Several odd phænomena depend upon the principle of the center of gravity. As for example, the double cone or ſpindle A C B D, (Plate XXXI. *fig.* 7.) being laid on at E, upon the lower parts of the rulers E F, will, of itſelf move towards E F, though thoſe ends are raiſed up to the heights F G by the two ſcrews F G, and by that means will ſeem to move upwards. How high F G may be in proportion to the bigneſs of the ſpindle A B C D, is eaſily demonſtrated from the rules already laid down.

Again, let A B, (*fig.* 8.) be a rolling lamp, that has within it the two moveable circles D E and and F G, whoſe common center of motion is at K, where their axis of motion croſs one another, there point is alſo their common center of gravity. If to the inward circle you join within ſide the lamp K C made pretty heavy and moveable about its axis H I, and whoſe center of gravity is at C, the common center of gravity of the whole machine will fall between K and C, and by reaſon of the pivot A, B, D, E, H, I, will be always at liberty to deſcend; and therefore let the whole lamp be rolled along the ground, or moved in any manner, the flame will always be uppermoſt, and the oil cannot ſpill. Thus are the compaſſes hung at ſea, and thus ſhould all the moon lanthorns be made that are carried before coaches or carriages that go in the night.

Upon the table T *t* T, *fig.* 9, which has a ſlit from X to *x*, ſet the little image D M in ſuch a manner, that the ſaw *c*, which is faſtened at one end to the hands of the image, and has a weight W fixed at the other end, may paſs through the ſlit X *x*, and the image will ſtand in an upright poſture: then if the head of the image be brought down to A or B, it will imitate the motion of ſawing, and vibrate ſeveral times in the arc A *o* B, whilſt the weight W, does in the ſame manner deſcribe the arc V W V, the center of motion of the whole, (that is, of the image, ſaw, and weight) being at M. The common center of gravity K, does likewiſe deſcribe the arc L K L, till (after having ſeveral times deſcended from L on either ſide) it comes to ſettle at K, juſt under the center of motion. If the image had no ſaw, it would ſtand upright when ſet on the table, becauſe its center of gravity C, would then be juſt over the center of motion M, and ſome of the image, which is in the line of direction O *o* would be ſupported; but the leaſt alteration of poſition that ſhould move *c* from over M would throw down the image. Then if the ſaw *c* be added, ſince its center of gravity is at *c*, the common center of gravity of the man and ſaw will be at L, and in that caſe the image with its ſaw will fall towards X; but if by means of a curved wire, the heavy weight W be joined to the ſaw, the common center of gravity of the man, ſaw, and weight, will be at K, and the line of direction will again be O *o*, therefore the image will ſtand in its upright poſition. If now the image be inclined forwards or backwards, it will, after ſeveral vibrations, return to its firſt poſition, becauſe the center of gravity always endeavours to deſcend to K, in doing which it will bring the image upright.

Again, upon the ſtick S *s*, (*fig.* 9.) which of itſelf would fall from the table, becauſe its center of gravity hangs over, ſuſpend the pail *p*, fixing another ſtick *q p*, one end in a notch at *p*, and the other againſt the inſide of the pail, cloſe to the bottom, and the pail, without any other help, will be ſupported on the ſticks S *s*, which will not fall from the table, though the pail be afterwards filled full of water, provided the handle of the pail be pretty near the table, and the ſtick *p q* long enough to puſh the pail a little out of the upright.

When the ſtick S S (*fig.* 10.) is horizontal to the table T *d* B, *c* is the common center of gravity of the two ſticks S S, and P Q, the pail D Q E, and the water contained in it, all which taken together, are to be looked upon as one body, whoſe line of direction is O O; and as the part of S S, which is a little behind the bale, or handle B, is in the line of direction, and ſuſtained upon the edge of the table, the whole body above-mentioned cannot fall, for if it did, the part B S muſt riſe at the end S into the poſition B *s*, and P S deſcend into the poſition *p s*, which cannot happen unleſs the pail riſes into the poſition *d q e*, bring up the common center of gravity to *c* in the arc C *c* D, which is impoſſible from gravity alone, without the action of an extrinſical agent.

But if the pail D E be liſted up under the table, and the ſtick S S inclined above it, ſo that the whole machine comes into the poſition *s s*, *p e*, *q d*; and the ſtick *s s* is ſmooth as well as the table, if then it be left to itſelf, the whole machine will ſlide down, and ſo fall from the table; *s s* moving in the direction *s p s*, and the common center of gravity *c* E, tangent to the arc D *c* C.

Here

Here it is obſervable, that as $o\,o$ is now the line of direction, no part in the ſaid body is ſupported.

Theſe are a few of the curious phænomena that depend on the principles of the center of gravity, and they who are deſirous of ſeeing more, may conſult Deſagulier's Experimental Philoſophy, where they may find great variety, and from whence we have taken ſome of the above, and likewiſe ſome from Mr. Emerſon's Fluxions.

CENTER *of Magnitude*, is that point which is equally diſtant from all the external parts of any body.

CENTER *of Motion*, is that point round which a body or machine moves, or endeavours to move, when it cannot or does not move quite round; and in that caſe all the points of the body deſcribe circles, or arcs of circles about the center of motion. This center may be taken any where, according to the make of the machine.

CENTER *of Oſcillation*, is the point in the axis of a vibrating body, in which, if a ſmall body or particle be placed, it ſhall perform its vibrations after the ſame manner in the ſame time, and with the ſame angular velocity as the whole body. From the above definition of the center of oſcillation, it is eaſy to underſtand that it is the very ſame with the center of percuſſion, in the body or rod A B, (Plate XXXI. *fig.* 11.) for ſince the point G is that in which the forces of all the particles are united to generate motion in the body, and the center of percuſſion, is that in which alone the motion of the body can be deſtroyed, it neceſſarily follows they are both one and the ſame point; and therefore if A B be of an uniform figure, it will be iſochronal, or vibrate in the ſame time with the common pendulum F C = A G = $\frac{2}{3}$ A B. Therefore, ſince the center of oſcillation and the center of percuſſion is the ſame, we ſhall give a general rule with ſome examples for finding the ſaid central point, under the article CENTER *of Percuſſion*, which ſee.

CENTER *of Percuſſion*, is that point in the axis of a vibrating body, which ſtriking againſt an immoveable obſtacle, the body ſhall incline to neither ſide, but reſt as it were in equilibrio in that point. This percuſſive force ariſes from three ſources, viz. 1ſt, from the maſs of matter in the percutient body. 2d, From its gravitating force, in regard to its diſtance from the center of motion; and 3dly, From the actual velocity of the motion itſelf.

The two firſt make the momentum, and this compounded with the latter, conſtitutes the percuſſive force.

To find the center of percuſſion, oſcillation, and the center of preſſure of any plane immerſed in a fluid, and containing that fluid.

As the above three centers are each in the ſame point, they conſequently are found by the ſame method, therefore we ſhall firſt give one general method for finding the ſaid point, and then give a few examples for finding the ſame in particular bodies.

Through the point of ſuſpenſion C, (Plate XXXI. *fig.* 12.) and center of gravity, draw the axis of the body C O; and ſuppoſe O to be the center of percuſſion, oſcillation, preſſure, &c. required. Thro' C O draw the plane in which the center of gravity moves, and imagine the body to be divided into innumerable ſmall priſms, all perpendicular to this plane, and let them be ſuppoſed to be reduced to, or ſituated in the points, where they interſect the plane, and let p be one of thoſe ſmall priſms. Draw $p\,f$ perpendicular to C O, and $p\,d$ perpendicular to C p; then $p\,d$ will be the direction of p's motion, as it revolves about C, and the body being ſtopped at O, p will urge the point d forward with a force proportionable to its magnitude and velocity, that is as $p \times$ C p, therefore the force wherewith p acts at d, in a direction perpendicular to C O, will be $p \times$ C f, and the force by which p endeavours to turn the body about O, will be as $p \times$ C $f \times d\,o$; or $p \times$ C $f \times$ C O $-$ C d, that is, as $p \times$ C $f \times$ E O $- p \times$ C p^2. Now ſince the ſum of all theſe forces to turn the body about O, muſt be $= o$, therefore all the $p \times$ C $f \times$ C $o - p \times$ C $p^2 = o$, or all the $p \times$ C $f \times$ C O = all the $p \times$ C p^2. Therefore C O = $\frac{\text{Sum of all } p \times \text{C } p^2}{\text{Sum of all } p \times \text{C } f}$.

Therefore if s be equal the body, C $p = x$, C $f = v$, $d\,p = z$, then the ſum of all the C $p^2 \times p =$ ſum of $x^2\,\dot{s} =$ the fluent $x^2\,s$, and the ſum of C $f \times p =$ the ſum of $v\,\dot{s} =$ fluent of $v\,s$. And the ſum of $d\,p^2 \times p =$ ſum of $z^2\,\dot{s} =$ fluent of $z^2\,s$; therefore C O = $\frac{\text{Fluent of } x^2\,s}{\text{Fluent of } v\,s} = \frac{\text{Fluent of } x^2\,s}{\text{C } d \times \text{body A D}}$ = C $d + \frac{\text{Fluent of } z^2\,s}{\text{C } d \times \text{body A D}}$. Therefore if we ſuppoſe the body to be deſcribed or generated by a plane perpendicular, to the axis of the body, or parallel to the axis of motion we ſhall have the following.

Rule. Firſt multiply the fluxion (or if the caſe require the ſecond fluxion) of the body, by the ſquare of the generating plane from the axis of motion, and find the fluent once or twice, as there is occaſion by help of the equation of the figure, which call F. Secondly, Multiply the fluxion of the body by the diſtance of the point of ſuſpenſion, to the point where the generating plane (or line, &c.) cuts the axis of the body, and find the fluent which call M; and let d be equal the diſtance from the point of ſuſpenſion to the center of gravity, and B = the body, then $\frac{F}{M}$ or $\frac{F}{d\,B}$ will be the diſtance

tance of the center of percuſio, oſcillation, or center of preſſure, &c. from the point of ſuſpenſion.

We ſhall give a few examples, to ſhew the uſe of the above general rule in particular bodies, &c.

Example I. Let CB be a right line, (*fig.* 13.) $CB = x$, then $\dot{F} = x^2\dot{x}$, and $F = \frac{x^3}{3}$; alſo $\dot{M} = x\dot{x}$, and $M = \frac{x^2}{2}$; whence $\frac{F}{M} = \frac{2}{3}x = CO$.

Example II. In a parallelogram, (*fig.* 14.) where the axis of motion is in the plane of the figure, $CB = x$, $BD = b$, then $\dot{F} = bx^2\dot{x}$, and $F = \frac{bx^3}{3}$; alſo $\dot{M} = bx\dot{x}$, and $M = \frac{bx^2}{2}$; whence $\frac{F}{M} = \frac{2}{3}x = CO$.

Example III. Let AD be the arch of a circle, (*fig.* 15.) the center C the point of ſuſpenſion, and the axis of motion perpendicular to its plane; let arch $ABD = s$, cord $AD = c$, $CB = r$. Then $F = rrs$; $d = \frac{rc}{s}$; therefore $\frac{F}{dB} = \frac{F}{ds} = \frac{rs}{c}$.

Example IV. Let AD be a right line, (*fig.* 16.) the action of motion perpendicular to the plane paſſing through it. $CB = d$, $BA = y$, then $F = \overline{dd + yy} \times y$, and $F = 2ddy + \frac{2}{3}y^3$; alſo $M = 2dy$; whence $\frac{F}{M} = \frac{2ddy + \frac{2}{3}y^3}{2dy} = d + \frac{yy}{3d}$.

Example V. For the periphery of a circle, (*fig.* 17.) let $CD = d$, radius $AD = r$, circumference $= c$. If the axis of motion be perpendicular to its plane, then $G = rrc$, and $d + \frac{G}{dB} = d + \frac{rrc}{dc} = d + \frac{rr}{d}$.

Example VI. For the periphery of the circle, (*fig.* 17.) parallel to ED, radius $DB = r$, $BA = v$, $DL = z$, $CD = d$, then $\dot{G} = 4zz\dot{v} = \frac{4rzz\dot{z}}{\sqrt{rr - zz}}$, and the whole fluent $G = \frac{rrc}{2}$; then $d + \frac{dB}{G} = d + \frac{rrc}{2dc} = d + \frac{rr}{2d}$.

Example VII. In an iſoceles triangle, (*fig.* 18.) where the axis of motion is parallel to the baſe, let $CD = a$, $CA = x$, $BE = f$, then $IK = \frac{fx}{a}$, and $\dot{F} = \frac{fx^3\dot{x}}{a}$; whence $F = \frac{fx^4}{4a}$; alſo $\dot{M} = \frac{fx^2\dot{x}}{a}$, and $M = \frac{fx^3}{3a}$; therefore $\frac{F}{M} = \frac{3}{4}x = \frac{3}{4}a$.

If the axis at C be perpendicular to the plane of the triangle, let $AQ = v$, then $\dot{F} = x\dot{x} + v\dot{v} \times \dot{x}\dot{v}$, and $\dot{F} = x^2\dot{x}v + \frac{v^3\dot{x}}{3}$ (becauſe $v = \frac{fx}{a}$) $\frac{fx^3\dot{x}}{a} + \frac{f^3x^3\dot{x}}{a^3}$; whence $F = \frac{fx^4}{4a} + \frac{f^3x^4}{4a^3} = \frac{fa^3 + f^3a}{4}$; therefore $\frac{F}{M} = \frac{3}{4} \times \frac{aa + ff}{a}$.

In the parabola, (*fig.* 19.) CAF, $AC = x$, $AF = y$, $AQ = v$, $ax = yy$; let the axis in C be parallel to AF, then $\dot{F} = yx^2\dot{x}$, $= x^2\dot{x}\sqrt{ax}$, and $F = \frac{2}{7}x^3\sqrt{ax}$; and $\dot{M} = yx\dot{x} = x\dot{x}\sqrt{ax}$, and $M = \frac{2}{5}x^2\sqrt{ax}$. Therefore $\frac{F}{M} = \frac{2}{7}x$.

If the axis be perpendicular to its plane; then $\dot{F} = \overline{x\dot{x} + v\dot{v}} \times \dot{x}\dot{v}$, and $\dot{F} = x^2v\dot{x} + \frac{v^3\dot{x}}{3}$ $= yx^2\dot{x} + \frac{y^3\dot{x}}{3} = x^2\dot{x}\sqrt{ax} + \frac{ax\dot{x}\sqrt{ax}}{3}$; whence $F = \frac{2}{7}x^3\sqrt{ax} + \frac{2}{15}ax^2\sqrt{ax}$. Therefore $\frac{F}{M} = \frac{5}{7}x + \frac{1}{3}a$.

Example IX. Let AB be the ſurface of a ſphere, (*fig.* 30.) $AB = s$, $BE = z$, radius $AD = r$, c = circumference. Then the circumference of $BE = \frac{cz}{r}$, and $\dot{G} = \frac{cz^2\dot{s}}{r} = \frac{cz^2}{r} \times \frac{r\dot{z}}{\sqrt{rr - zz}}$; whence $G = \frac{2cr^3}{3} - \frac{2cr^2}{c} - \frac{czz}{3}\sqrt{rr - zz} = \frac{2cr^3}{3}$. And $B = rc$; therefore $d + \frac{G}{dB} = d + \frac{2rr}{3d}$.

Example X. Let ABQD be a parallelepipidon, (*fig.* 21.) the axis of motion perpendicular to the plane ABQD; let $AB = 2a$, $AD = 2b$. Breadth $= c$, $GS = x$, $SZ = y$; then $\dot{G} = \overline{x\dot{x} + y\dot{y}} \times 4c\dot{x}\dot{y}$, and $\dot{G} = 4cx^2y\dot{x} + \frac{4cy^3\dot{x}}{3} = 4cbx^2\dot{x} + \frac{4}{3}cb^3\dot{x}$: Therefore $G = \frac{4}{3}cbx^3 + \frac{4}{3}cb^3x = \frac{4}{3}cba^3 + \frac{4}{3}cb^3a$; alſo $B = 4acb$: Therefore $d + \frac{G}{dB} = d + \frac{aa + bb}{3d}$.

Example XI. In a cylinder, (*fig.* 22.) let $CA = x$, $AD = r$, $Ae = y$, $CH = a$, the axis of motion parallel to AB; then $\dot{F} = x\dot{x} + y\dot{y} 4 \times \dot{x}\dot{y}\sqrt{rr - yy}$ and the whole fluent $\dot{F} = \frac{rcx^2}{2} + \frac{r^3c\dot{x}}{8}$. And $F = \frac{rcx^3}{6} + \frac{r^3cx}{8}$; which corrected gives $F = \frac{rcx^3 - rca^3}{6} + \frac{r^3cx - r^3ca}{8}$, and $B = \overline{x - a} \times \frac{rc}{4}$, then will $\frac{F}{dB} = \frac{2x^3 - 2a^3}{3x^2 - 3aa} + \frac{rrx - rra}{2x^2 - 2aa} = \frac{4x\dot{x} + 4ax + 4aa + 3rr}{6x + 6a}$.

Example XII. Let CKB be a pyramid, (*fig.* 23.) whoſe baſe is a parallelogram, and axis of motion in C perpendicular to the plane CEF; let its altitude $= a$, $AB = f$, $AD = c$, $CH = x$, $HL = y$,

$= y$, then $KI = \frac{cx}{a}$, and $EF = \frac{fx}{a}$, and $\dot{F} = \overline{\dot{x}\dot{x} + \dot{y}\dot{y}} \times \frac{cx\dot{x}\dot{y}}{a}$; and $\dot{F} = \frac{cx^3\dot{x}}{a}y + \frac{cx\dot{x}y^3}{3a} = \frac{cfx^4\dot{x}}{aa} + \frac{cf^3x^4\dot{x}}{12a^4}$. And $F = \frac{cfx^5}{5aa} + \frac{cf^3x^6}{60a^4}$. Also $\dot{M} = \frac{cfx^3\dot{x}}{aa}$, and $M = \frac{cfx^4}{4aa}$; whence $\frac{F}{M} = \frac{4}{5}x + \frac{ff}{15aa}x = \frac{12aa+ff}{15a}$.

Example XIII. In a right cone, (*fig.* 24.) let $CA = g$, altitude $= a$, radius of the base $= f$, $AB = x$, $BI = z$, $c = 3.1416$, then BE or $BD = \frac{fx}{a}$, $IE = \sqrt{\frac{ffxx}{aa} - zz}$; then $\dot{F} = \overline{g+x}^2 \overline{+zz} \times 4\dot{x}\dot{z} \times \sqrt{\frac{ffxx}{aa} - zz}$, and $\dot{F} = \overline{g+x}^2 \times \frac{cffx^2\dot{x}}{aa} + \frac{cf^3x^4\dot{x}}{4a^4}$, consequently $F = \frac{1}{3}ggcx^3 + \frac{1}{2}gcx^4 + \frac{1}{5}cx^5 + \frac{cfx^5}{20aa} : \times \frac{ff}{aa}$; also $\dot{M} = \overline{g+x} \times \frac{cffx^2\dot{x}}{aa}$, and $M = : \frac{1}{3}gcx + \frac{1}{4}cx^4 : \times \frac{ff}{aa}$; whence $\frac{F}{M} = \frac{20gg+30ga+12aa+3ff}{20g+15a}$.

Example XIV. Let AD be a paraboloid, (*fig.* 25.) $CA = a$, $AB = x$, $BD = y$, $BI = z$, $c = 3.1416$, $rx = yy$. Then $\dot{F} = : \overline{a+x}^2 + zz : \times 4\dot{x}\dot{z} \times \sqrt{yy - zz}$; therefore $\dot{F} = \overline{a+x}^2 \times cyy\dot{x} + \frac{cy^4}{4}\dot{x} = \overline{a+x}^2 \times crx\dot{x} + \frac{1}{4}cr^2x^2\dot{x}$; whence $F = \frac{1}{2}caarxx + \frac{2}{3}carx^3 + \frac{1}{4}crx^4 + \frac{1}{12}crrx^6$. Also $\dot{M} = \overline{a+x} \times cy^2\dot{x} = \overline{a+x} \times crx\dot{x}$, and $M = \frac{1}{2}carx^2 + \frac{1}{3}crx^3$. Therefore $\frac{F}{M} = \frac{6a^2 + 8ax + rx + 3xx}{6a + 4x}$.

CENTER *of a parallelogram*, or *Polygon*, the point in which its diagonals intersect.

CENTER *of preſſure* is that point againſt which a force being applied equal the ſum of all the preſſures, ſhall juſt ſuſtain them, ſo as the plane ſhall incline to neither ſide.

This center of preſſure is the ſame with the center of oſcillation and percuſſion; and conſequently is to be found in the ſame manner. See the rule under the article CENTER of *Percuſſion*.

CENTER *of a Sphere*, a point in the middle, from which all lines drawn to the ſurface are equal.

Hermes Triſmegiſtus defines God an intellectual ſphere, whoſe center is every where, and circumference no where.

CENTESIMATION, a milder kind of military puniſhment, in caſes of deſertion, mutiny, and the like, when only every hundredth man is executed.

CENTIPES, in zoology, the ſame with the ſcolopendra. See SCOLOPENDRA.

CENTNER, among metallurgiſts and aſſayers, denotes a weight diviſible firſt in an hundred, and afterwards into other leſſer parts. However, it is to be obſerved, that the centner of metallurgiſts is the ſame with the common hundred weight; whereas that of aſſayers is no more than one dram, to which the other parts are proportional, and nevertheleſs paſs by the names 100 ℔. 64 ℔.

CENTO, in poetry, a work wholly compoſed of verſes or paſſages, promiſcuouſly taken from other authors, only diſpoſed in a new form and order.

Proba Falconia has written the life of Jeſus Chriſt in centos, taken from Virgil: Alexander Roſs has done the like in his Chriſtiados, and Stephen de Pleure the ſame.

Auſonius has laid down rules to be obſerved in compoſing centos: the piece, ſays he, may be taken from the ſame poet, or from ſeveral; and the verſes may be either taken entire, or divided into two; one half to be connected with another half taken elſewhere: but two verſes are never to be uſed running, nor much leſs than half a verſe taken.

CENTRAL, ſomething belonging or relating to center. See the article CENTER.

CENTRAL *Forces*, the power which cauſes a moving body to tend towards, or recede from the center of motion.

A body in motion continues its motion in a right line, and will not deviate from it, unleſs it be acted upon by a new impulſe; after the impulſe the motion is compounded, and out of theſe two, there ariſes a third ſtill in a right line. If therefore a body moves in a curve, it is acted upon every moment by a new impulſe; for a curve cannot conſiſt of ſtraight lines, unleſs ſuch as are infinitely ſmall. We have one example of ſuch a motion in the projection of heavy bodies; and another in all motions about a point taken as a center.

A body that is continually impelled towards ſome center, when projected in the direction of a right line, not paſſing through that center, will deſcribe a curve; and in all points thereof endeavours to recede from the curve, in the direction of its curvature; that is, in a tangent to the curve; ſo that if that force ſhould ſuddenly ceaſe from action, the body would continue its motion in a right line along that tangent.

A ſtone turned, run in a ſling, deſcribes a curve; the ſling does, as it were, every moment draw the ſtone back towards the hand; but if you let the ſtone go, it will fly out in a tangent to the curve. Therefore,

The

The force with which a body, in the caſe above-mentioned, endeavours to fly from the center, ſuch as is the force, by which the ſtring in motion is ſtretched, is called a centrifugal force.

But the force, by which a body is drawn, or impelled towards that center, is called a centripetal force.

Theſe forces, by a common name, are called central forces.

In every caſe, the centrifugal and centripetal forces are equal to one another: for the former is the reſidence of the body, while it is drawn by the centripetal force. Here it may be applied whatever has been ſaid of a reſiſtance from inactivity.

A body is kept in a curve by a centripetal force, and endeavours to fly from it by a centrifugal force. The ſling in motion is equally ſtretched both ways, and the ſtone endeavours to fly from the hand, with the ſame force that the hand holds it; that is, it is drawn towards the hand.

Central forces are of great uſe in natural philoſophy; for all the planets move in orbits, and moſt of them, if not all, revolve about their axes.

When a body laid upon a plane, does in the ſame time and above the ſame center revolve with that plane, and ſo deſcribes a circle; if the centripetal force, by which the body is drawn or impelled every moment towards that center, ſhould ceaſe to act, and the plane ſhould continue to move with the ſame velocity; the body will begin to recede from the center, in reſpect of the plane, in a line which paſſes through the center. The body indeed endeavours to fly off in a tangent; but the point of the circle to which it anſwers, is moved with the body and the motion along the tangent of the circle at reſt, in the firſt moment, is agitated by the radius of the circle moved with the ſame velocity as the body.

When a body projected is acted upon by a force tending to ſome center, it moves in that plane which paſſes through the direction of the projection, and the center of the forces.

When a body moves about a center, if in its motion it comes nearer to the center, its motion is accelerated; but on the contrary retarded, if it recedes from the center.

This acceleration and retardation is ſubject to the following law.

A body that is retained in a curve by a force, tending towards a center, deſcribes areas about that center proportional to the times.

Let there be a given body deſcribing the curve A B D E, (Plate XXXI. *fig.* 26.) in which it is retained by a central force tending to C; if lines be drawn at pleaſure, as A C, B C, D C, E C, the area of the mixed line triangle A C B will be to the area D C E, as the time in which the body moves through A B is to the time in which the body moves through D E.

The propoſition being the inverſe of this, is alſo true, viz. That a body which is moved in any curve in a plane, and deſcribes areas about ſome point proportional to the times, it is turned out of the right line, and urged by a force tending to that point.

We ſhall now ſhew how to compare central forces with one another; for which purpoſe we are to conſider a centripetal force, as a preſſure acting upon a body. Becauſe the body is turned out of a ſtraight line in every point, the deflection of a right line every moment is the immediate effect of a preſſure; ſo that what has been demonſtrated of the actions of powers upon obſtacles left to themſelves, may be applied here.

The greater the quantity of matter in any body is, the greater is its centrifugal force, all things elſe being alike; ſince the inactivity being greater, it is drawn towards the center with more difficulty.

If fluids of equal quantities, but unequal weights, be included in a determinate ſpace, ſo that the heavier cannot recede from the center, unleſs the lighter comes towards it, and they be ſo diſpoſed, that by their weight the heavier comes to the center; upon moving the whole about that center, the lighter fluid will be carried towards the center, and the heavier ones will fly from it.

If a ſolid with a fluid be included in a determinate ſpace; if it be lighter than the fluid, it will come to the center; if heavier, it will recede from that center: all of which proceeds from the heavy bodies having the greater centrifugal force.

Central forces do not only differ with reſpect to the quantity of matter, but the diſtance from the center does alſo cauſe an alteration; and likewiſe the velocity with which the body moves about: there is nothing elſe can make a difference in theſe forces: and theſe are all the things to be conſidered when we compare them together.

When the periodical times are equal, and the diſtances from the center are equal, the central forces are to one another, as the quantities of matter in the revolving bodies.

When the quantities of matter in the revolving bodies are equal, and the periodical times are equal, the central forces are as their diſtances from the center.

When the periodical times are equal, but the diſtances from the center, and the quantities of matter in the revolving bodies are different, the central forces are in the ratio, compounded of the quantities of the matter, and of the diſtances; which follows from the two laſt propoſitions. And to determine this compound ratio, the quantity of matter in each body, muſt be multiplied by its diſtance from the center, and the products will have the ratio required.

The differences of central forces, ariſing from the different diſtances from the center and the quantities of matter, may have a mutual compenſation;

and ſuppoſing the quantities of matter in the revolving bodies, to be in the inverſe ratio of the diſtances from the center, the central forces will be equal; as much as one force is greater than another, with reſpect to the quantity of matter, ſo much does this exceed that, becauſe of the greater diſtance.

This caſe of the propoſition takes place, when two bodies joined by a thread revolve about the common center of gravity; for the diſtances from this center are in the inverſe ratio of the weights of the bodies, and therefore the central forces are equal. One body is drawn to the center with the ſame force that the other endeavours to recede from it; and becauſe of the equality of the forces, they mutually keep up each other, and continue the motion. If they revolve about ſome other point, they will not continue in motion; and that body, whoſe centrifugal force prevails, will recede from the center, and the one body will carry the other along with it.

The difference of central forces, may alſo be determined from the periodical time.

When the quantities of matter of the bodies moved round, and the diſtances from the centers are equal, the central forces are in an inverſe ratio of the ſquares of the periodical times; that is, directly as the ſquares of the revolutions performed in the ſame time.

However the central forces differ from one another, they may from what has been already ſaid, be compared to one another; for they are in the ratio compounded of the quantities of matter in the revolving bodies, and the ratio of the diſtances from the center, as likewiſe in the inverſe ratio of the ſquares of the periodical times. If you multiply the quantity of matter in each body, by its diſtance from the center, and divide the product by the ſquare of the periodical time, the quotient of the diviſion will be to one another in the ſaid compounded ratio; that is, as the central forces.

When the quantities of matter are equal, the diſtances themſelves muſt be divided by the ſquares of the periodical times, to determine the proportion between the central forces.

In that caſe, if the ſquares of the periodical times be to one another as the cubes of the diſtances, the quotients of the diviſion will be the inverſe ratio of the ſquares of the diſtances; and in this ratio are alſo the central forces.

When the bodies be unequal, and central forces of the ſame nature with gravity act upon them, it matters not what the maſſes of the bodies be, or how they move, they are drawn towards the center in equal moments, ſpaces which are proportional to thoſe forces, and the laſt proportion takes place even in unequal bodies.

A body may deſcribe ſeveral ſorts of curves by a central force.

Geometricians call an ellipſis an oval line, whoſe generation is this; let A *a* (Plate XXXI. *fig.* 27.) be a right line; C the middle point thereof; F, *f* points equally diſtant from C; F G *f* a thread whoſe ends are faſtened in F, *f*, and length equal to the line A *a*. Then if the thread be ſtretched, an ellipſis may be deſcribed in the ſame plane wherein is A *a*, by the motion of a pin G.

If a cone or a cylinder be but by a plane, the ſection will often be ſuch a line. The points F, *f*, are called the foci, C the center, A *a* the greater axis, and B *b* paſſing through the center, perpendicular to A *a*, and terminated both ways by the curve, is the leſſer axis.

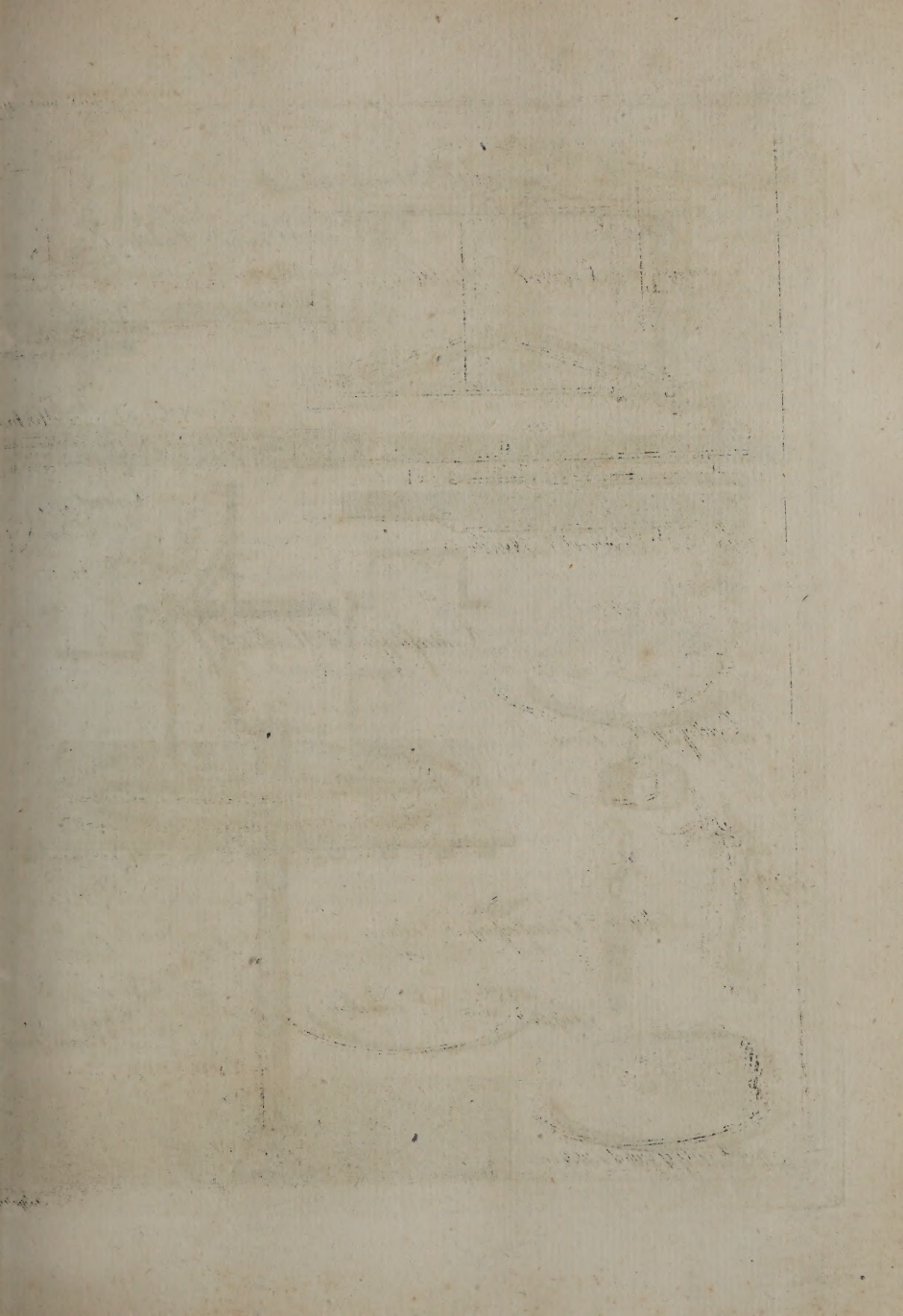
Let us ſuppoſe the force, mentioned in the laſt proportion, acting upon bodies in motion, juſt as upon thoſe at reſt, which is equal at equal diſtances from the center, but at different diſtances is inverſely as the ſquare of the diſtance; the body by this force would move in an ellipſis, one of whoſe foci coincides with the center of the forces; ſo that a body may deſcribe a curve running into itſelf, and in every revolution will once come towards the center of forces, and once go farther from it. In the receſs the velocity of the body is leſſened, and indeed ſo, that the central force, although that be leſſened itſelf, it bends in the path of the body, and makes its endeavour to come towards the center. In the acceſs the velocity will be ſo augmented, that although the force be augmented, the body again recedes from the center.

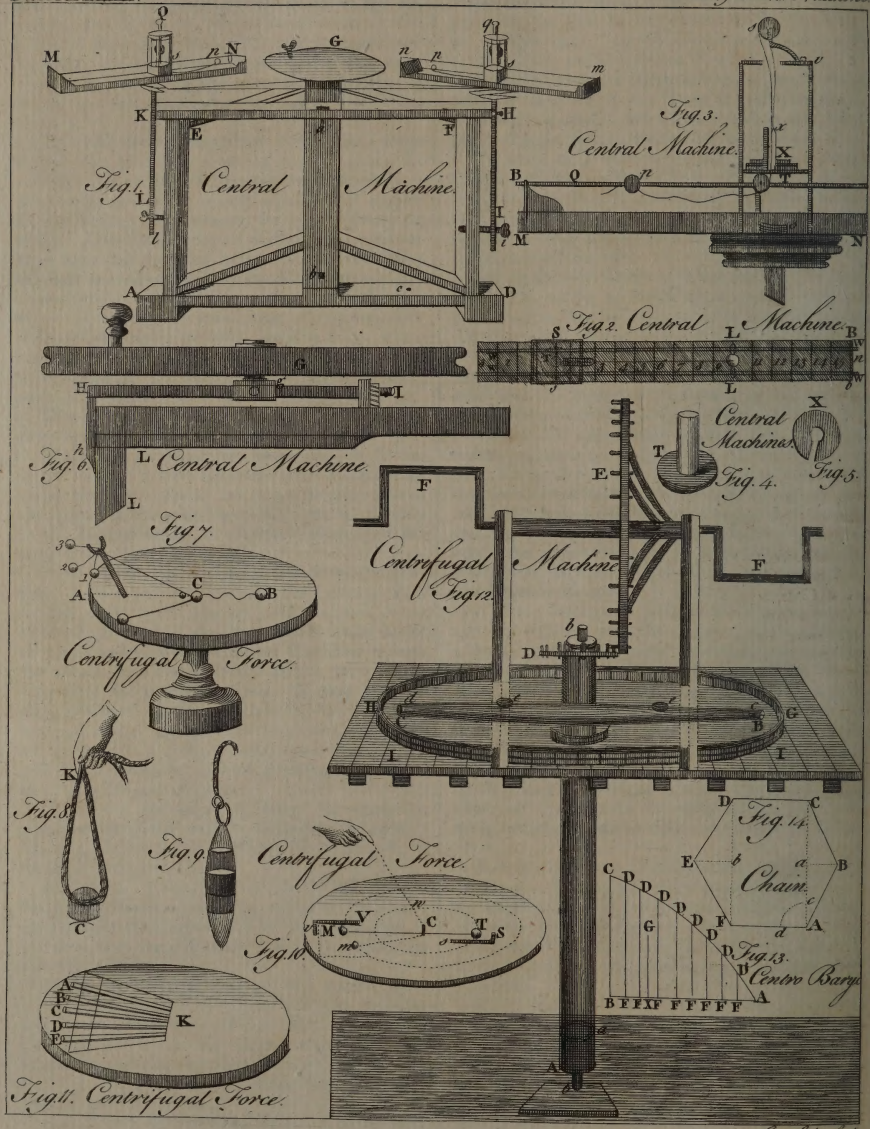
A circle belongs to theſe kind of curves, when the foci coincide with the centre. And ſuppoſing a body, as we here ſaid, to deſcribe an ellipſis, another body will be retained by the ſame force about that center, if this be projected with a juſt velocity perpendicularly to the line paſſing through the center. If the diameter of the circle be equal to the greater axis of the ellipſis, the body will be urged with that velocity, whereby the body moves in an ellipſis in that moment, as it paſſes through either of the ends of the leſſer axis; and both theſe bodies will make their revolutions in equal times.

A body may be projected with ſuch velocity, that the force in the receſs from the center, which upon the augmentation of the diſtance is leſſened, is not ſufficient to bend in the body's path, ſo that it may return again: in this caſe the body will deſcribe another of the conical ſections, either a parabola or hyperbola.

If the central force as you go from the center decreaſes in any other proportion, the body will not deſcribe a line returning into itſelf, and ſomewhat differing from a circle.

But if the force decreaſes in a proportion a little different from that, the curve deſcribed by the body may be taken as a moveable ellipſis, whoſe axis will move with an angular motion in the plane in which the





J. Ledger Sculp.

the body revolves, the focus remaining in the center of the forces. But the motion of the axis tends the ſame way with the motion of the body, if the force decreaſes ſwifter upon augmenting the diſtance, than in the inverſe ratio of the ſquare of the diſtance.

But if the force be ſlower; that is, decreaſes leſs as you go on from the center, the motion of the ellipſis will be the contrary way.

A body will alſo deſcribe an ellipſis, if the central force, as you go from the center, increaſes and is every where in the ratio of the diſtance from the center, which in that caſe coincides with the center of the ellipſis.

If alſo a force increaſes in any other ratio, the curve will not return into itſelf, but may often be referred to an ellipſis, moveable in a plane about a center: whence it follows, that an excentrical curve returning into itſelf, can be deſcribed by no central force; that is, one whoſe center does not coincide with the center of the forces, and a ſmall matter differing from a curve, except an ellipſis, in one of whoſe foci the center of the forces is, and that the central force in this caſe is inverſely as the ſquare of the diſtance.

But it eaſily appears that a circle whoſe center coincides with the center of the forces, may be deſcribed by a force increaſing or decreaſing in any given ratio; ſuppoſing it to act equally at equal diſtances.

CENTRAL-RULE, is a rule, or method diſcovered by our countryman, Thomas Baker, whereby we are enabled to find the center of a circle deſigned to cut the parabola, in as many points as an equation to be conſtructed hath real roots. Its principal uſe is in the conſtruction of equations, which he has applied with good ſucceſs as far as biquadratics.

The central-rule is chiefly founded on this property of the parabola: that if a line be inſcribed in that curve perpendicular to any diameter, a rectangle, formed of the inſcript, is equal to a rectangle made of the intercepted diameter and parameter of the axis.

The central rule has the advantage over Carter's, and De Latteres's method of conſtructing equations, in that both theſe latter are ſubject to the trouble of preparing the equation by taking away the ſecond term. This we are freed from in Baker's method, which ſhews us how to conſtruct all equations not exceeding the fourth power, by the interſection of a circle and parabola, without the omiſſion or change of any terms.

CENTRAL MACHINE, a machine invented to ſhow the laws of the central forces experimentally, of which take the following deſcription, as given by Dr. Deſaguliers.

(Plate XXXII. *fig.* 1.) The machine for central forces conſiſts of a ſtrong wooden frame CABDHGKEF triangular at top and bottom. On the horizontal piece G*a* at top is a wheel G, which (by means of the ſtring GKHG) when turned round, gives circular motion to the pullies and ſpindles KL and HI, ſo as to move them either with equal velocities, or with velocities that are as 2 to 1, as 3 to 1, or as 3 to 2; becauſe in the pulley K there are two grooves, one of 3, and one of 2 inches diameter; and in the pulley H there are alſo two, one of 6, and one of 3 inches diameter. There are two pieces MN, *m n* (which we may call planet-bearing pieces) of about 30 inches long, to be ſcrewed upon the pullies K, H, ſo as to turn round with them. Theſe pieces have each of them an open ſquare tower S, *s*, with a little pulley at top and bottom to conduct a ſtring from the weights S and *s*, to the braſs balls P and *p*, (which we muſt here call planets) ſo that when P and *p* go towards N or *n*, the weights are drawn up from their baſes, which is about an inch above the bottom of the towers, and riſe within the towers till the weight-carrying piece ſtrikes the top of the tower; each ball having two little wings with holes in them to ſlide eaſily along little wires that go from one end to the other of the planet-carrying piece, paſſing through the two perpendicular braſs planes M and N, alſo through the towers at about the diſtance of one fourth of an inch from the ſurface of the planet-carrying piece. N. B. Only one of the wings and one of the wires is here drawn upon each piece to avoid confuſion. There are alſo braſs collars at H and K, in which the necks of the ſpindles (which are of ſteel) turn; and iron ſcrews headed with braſs at L and I, with little holes to receive the bottoms of the ſpindles.

The ſecond figure repreſents ſomething more than half of one of the planet-bearing pieces divided into inches both ways from the center. B*b* is the perpendicular braſs plane at one end, through which the horizontal wires W *w*, W *w* paſs, to carry the planet P by its perforated wings L L, whilſt the ſtring that goes through the middle of the planet is made faſt, by thruſting in the little pin *p* to give the planet any certain diſtance from T the center of its motion before it is moved round by turning the wheel G (in *fig.* 1.) S *s* repreſents the ſection of the braſs tower faſtened to the wood by a croſs pin, whoſe head is ſeen at *s*. T is the baſe or plate which is to ſupport the weight-carrying piece, which is repreſented at (*fig.* 4.) and conſiſts of a circular plate and hollow ſtem of two ounces weight, and on which may be ſlipped ſeveral leaden weights like X (*fig.* 5.) At T alſo (*fig.* 2.) may be ſeen the little pulley under which the ſtring goes.

The 3d figure is a vertical ſection of one of the ſquare towers S *s*, with the weight X, and weight-carrying piece X *x* in it, and pair of the planet-bearing piece, pulley and ſpindle under it, marked MN. One little pulley is faſtened to the wood at

T under the plate on which the weights ſtand; another is ſuſtained by an iron arm V S over an hole S in the top of the tower. So that the ſtring coming from the planet P goes firſt under the pulley T, then through the hollow ſtem of the weight-carrying piece, and ſo through the hole in the top of the tower, then over the pulley S, ſo down again to the top of the ſtem of X, where it is faſtened. By obſerving this figure, one may eaſily ſee that if the planet P be moved ever ſo little in the direction of I Q, the weight-bearing piece X will be raiſed up towards S.

The whirling table which we have already mentioned for making ſeveral experiments, is beſt turned round by ſcrewing on to the top of either of the ſpindles L K or I H, inſtead of the planet-bearing piece M N or *m n*.

The ſixth figure repreſents the ſection of the wheel and part of the horizontal piece, the upper part of the frame which carries the wheel, and the upper end of the piece that ſupports it marked L L L, the wheel's axis and ſquare-ſliding collar *g*, which is moveable on the ſquare horizontal iron H I faſtened to the wood by a nut and pin at I, and two wood-ſcrews H *h*. N. B. There is a ſcrew in the ſliding piece *g* to fix the center of the wheel, when it is brought forwards or backwards.

Tho' it be of no conſequence of what bigneſs the machine above deſcribed is made, provided its parts are proportional; yet for the ſake of thoſe who would have ſuch a machine made, I give here the meaſures of the principal parts of mine in Engliſh inches.

(Plate XXXII. *fig.* 1.) The thickneſs of the wood every-where about 1 inch, except the feet at A and D, where it is 2 inches thick.

M N = *m n* = 30 inches.

K H 33⅙6 inches.

K L = I H = 8⅙5 inches.

A D = 34⅙9 inches.

A C = C D = 27⅙2 inches.

B C = 24⅙8 inches.

Diameter of the groove of the wheel G = 14 3 inches.

Breadth of the planet-bearing piece M N or *m n* = 2⅙3 inches.

Grooves of the pulley K, the one 2 and the other inches.

Grooves of H, the one 6 and the other 3 inches.

The height A K = H D = 13 inches.

Height of the towers S or *s* above the board M N, *m n* 5⅙8 inches.

Breadth of the towers = 23 inches.

There are 4 braſs planets made uſe of, two of which weigh each 2 ounces Troy, and the two other 4 ounces Troy each.

The weight-carrying plate and ſtem weighs 2 ounces, and each leaden weight (as repreſented by *fig.* 5.) weighs 2 ounces alſo.

What is to be conſidered in the uſe of the machine.

9. The weights in each tower are to repreſent the ſun, whoſe attraction is ſhewn by the force with which the weight reſiſts the action of the ball P or *p*, (repreſenting a planet) that endeavours to raiſe it by the ſtring P T S *x* (*fig.* 3.) when it receives a centrifugal force by turning the wheel G. So that by putting equal or unequal weights in the towers; by uſing equal or unequal planets, as P, or *p*; and by having their diſtances equal or unequal in different proportions; and the periodical times equal or unequal (as the wheel-ſtring goes round equal or unequal pullies) we may by experiments ſhew thoſe laws of central forces, which Sir Iſaac Newton has mathematically demonſtrated in his Principia.

In conſidering the central forces of bodies (for example, of the primary planets in reſpect of the ſun, and of the moons in reſpect to their primary planets) which move round other bodies that have an influence upon them; we are to obſerve three things. 1ſt, The periodical time, or times in which the bodies perform their revolution. 2dly, The quantity of matter in the revolving bodies. 3dly, The diſtance of the bodies from the center of the revolution.

Exper. I. Firſt, make the periodical times equal, by putting the wheel ſtring into the 2 inch groove of each pulley, croſſing it before each pulley to give it the more force to move the pullies, but ſo that the pullies may both turn the ſame way that the planet-bearing pieces may not unſcrew. Then put only the weight-carrying piece into each tower: and laſtly, faſten to their ſtrings a 2 ounce braſs ball, as P and *p*, at the diſtance of 12 inches from the center on each planet-bearing piece. So you will have the periodical times, the quantities of matter, and diſtances from the center equal. Give circular motion to the wheel G, and the planets by their centrifugal force will raiſe the planets S and *s* at the very ſame inſtant of time; which ſhews, that in this caſe the centrifugal forces are equal. N. B. If upon each weight-carrying piece you put on one or two, or more equal weights (ſuch as are expreſſed by *fig.* 5.) the planets will always raiſe them at the ſame inſtant, provided the wheel be turned proportionally faſter as there is more weight.

Exper. II. Secondly, Inſtead of *p* put on a 4 ounce ball, and double the weight in the weight *s*; then turn the wheel, and both weights will riſe at once. This ſhews, that when the quantities of matter are unequal, but the diſtances and periodical times ſtill remain equal, the centrifugal force is proportional to the quantity of matter.

Exper. III. Thirdly, take off the 4 ounce ball, and make uſe of *p* again, but put it only at 6 inches from the center. Take the additional weight from *s* and add it to S; that is, let the weight S, which has P at 12 inches diſtance, be = 4 ounces; and the weight *s*, which has *p* but at 6 inches diſtance, be = 2 ounces:

= 2 ounces: then upon turning the wheel, they will both rise at the same time. Hence it is plain, that if the periodical times, and the quantities of matter continue the same, but the distances are different, the centrifugal forces will be as the distances.

Exper. IV. Fourthly, at the distance of 6 inches, where *p* was last, change *p* for a 4 ounce ball, and put equal weights in the two towers; then when you turn the wheel, both weights will rise at once; which shews, that when the periodical times are equal, and the distances from the center reciprocally as the quantities of matter in the planets, the centrifugal forces are equal.

Exper. V. Lastly, Change the string on the pulley H, putting it into the groove of 6 inches diameter, so that the periodical time of the planet P, which last will then move twice as fast, if its distance be the same from the center, which it must be in this experiment. Put 8 ounces in the tower S Q, and only 2 in the tower *s q*, the equal planets P and *p* being then each at 12 inches distance from the center. Turn the wheel, and both weights will rise at once. This shews, that planets, that have an equal quantity of matter and the same distance from the center, but different periodical times, have their centrifugal forces reciprocally as the square of their periodical times; that is, directly as the square of their velocities.

Coroll. Hence follows, that if the same planet changes in velocity in the same orbit, its centrifugal force will increase or decrease according to the square of the velocity which the planet has in that orbit.

Scholium. When we compare the last experiment with the 3d experiment, and find that the planet (*p* going round in a circle of 12 inches radius at the same time that P went round in a circle of 6 inches radius,) raised twice the weight because it had twice the velocity; it will appear strange, that in the last experiment, where *p* (going twice through a circle of 12 inches radius, whilst P goes once through such a circle) has but double the velocity of P, it should now raise four times more weight. But this proportion (which is of very great use in explaining the motions of the heavenly bodies) will be very clearly deduced from a consideration of the first law and what we have said upon it.

CENTRIFUGAL Force, is that whereby a body revolving round a center, endeavours to recede from it.

Dr. Desaguliers, in his Experimental Philosophy, gives various experiments, to shew and illustrate the nature of centrifugal and centripetal forces, from which author the following experiments are collected.

Exper. I. (Plate XXXII. *fig.* 7.) A B C D is a round table which may be swiftly turned upon a pivot, as at F (the same that is represented by the the first figure on this plate.) There is a little brass pipe screw'd in at the center C, into the top of which the string of the leaden bullet B is thrust so as to go out at an hole in the side of the said short brass pipe; thence it is carried under the table thro' the hole *b*, and so fasten'd to a pin in the side of the table at A. When the bullet is laid at B, if the table be turn'd swiftly round, it leaves the bullet behind at first, which thereby appears to have a motion contrary to that of the table, till by the roughness of the surface of the table, it goes round at last along with the table on the same part of the table; then if the table be stopp'd on the sudden, the bullet goes on several turns, till having communicated all its motion to the rough surface of the table, it comes to rest at last. This illustrates the first law of nature; for as the part of the table under the bullet leaves it behind for a while, because it endeavours to continue in its state of rest, it would for ever leave it where it was at first, if the table was perfectly smooth: and when the bullet is once in motion it would for ever go round on the table, if (besides the smoothness of the table) the string that holds the ball had no friction at the center C. It is also to be observed, that the string, which is slack at C B, is always stretched as at C *b* by the motion of the bullet; and this shews the centrifugal force.

If we screw a forked prop toward the edge of the table as at D, and put the string of the bullet into its slit so as to let the bullet hang down as at 1, the force of the bullet's gravity may be so overcome by the centrifugal force, which the whirling of the table produces, that the bullet shall rise to 3, the string 3 *d* becoming horizontal: as the table turns slower and slower, the ball comes down to 2 and so to 1 at last, gravity becoming sensible as the centrifugal force diminishes.

Exper. II. (Plate XXXII. *fig.* 8.) If a string be tied round the brim of a pot full of water, and the pot be whirled round swiftly about the hand or center K in a circle or curve of which A C B is an arc, the water acquiring a centrifugal force greater than that of gravity, will not be spilled when the mouth of the pot is downwards. If instead of the pot, the glass W C (*fig.* 9.) containing liquors of different specific gravities be whirled round the center K, (after they have been confounded together by shaking) they will all recover their places and transparency, even sooner than if the glass containing them had been hung up and at rest. The reason is, that as the different substances in the glass have the same velocity given them by the centrifugal force, their momentum will be as their specific gravities, that is, their momentum will be made up of the different quantities of matter, which they contain under equal bulks multiplied by the common velocity which the centrifugal force gives them in the line K C from the center of the motion towards the circumference. Therefore the glass beads among the liquors weighing more than the

drops

drops of any of the liquors, will have the greateſt momentum, and conſequently go to the part G moſt remote from the center of motion K. Then the drops of oil of tartar (which is the heavieſt of the liquors contained in the glaſs) having for the ſame reaſon more momentum than the drops of the other liquors (tho' leſs than the glaſs beads) will take up the ſpace T next to the beads, and alſo fill their interſtices. The next liquor which is oil of Peter, will fill up the ſpace P. And laſtly, the ſpirit of wine, whoſe drops are the lighteſt, will (notwithſtanding its own centrifugal force) be brought nearer to the center of motion, and occupy the ſpace W; becauſe the beads and all the other liquors having more momentum, drive it from the end C, to which it has a tendency all the while. N. B. The tube is hermetically ſealed at both ends.

The glaſs beads, and different liquors, ſettle in their proper places when the tube is hung up; becauſe, as all bodies tend downwards with the ſame velocity, the momentum of particles of equal bulk muſt be as their reſpective quantities of matter in their deſcent: and that the liquors will not be ſo ſoon ſettled in this caſe as when the tube is whirled round, is becauſe we can give as great a velocity as we pleaſe in the direction K C, by a centrifugal force; whereas that which is owing to gravity is always the ſame.

Coroll. Hence it follows, that a bottle of any liquor (which after having been muddy is by length of time become fine, and is again made foul by ſhaking) may ſooner be brought to be fine by a centrifugal force, than by being ſet upright at reſt.

Exper. III. (Plate XXXII. *fig.* 10.) Join, by a ſtring, the two balls T. and M. whoſe weights are to one another as 4 to 2 (here we uſe a two-ounce to a four-ounce ball) and paſs the ſtring through the oppoſite ſide-holes of the little pipe C; let the length of the ſtring, meaſuring from center to center of the balls, be 18 inches, and the diſtances of the centers of the balls from the table be reciprocally as their maſſes; that is, the center of the two-ounce ball M muſt be at the diſtance of 12 inches from C, and the center of the four-ounce ball T at 6 inches from C. Let the two little ſquares, or rectangular pieces S *s* and V *v* be fixed on the table at the diſtance of about 1 inch or 2 behind the balls to ſtop them from flying off of the table, and the long ſides of thoſe pieces ſo fixed alternately, that when the table is made to turn in the direction marked by the dart, the balls may not be left behind, but immediately put into motion. Now let the table be whirled round with any velocity, and the balls will remain at the points T and M, and deſcribe round their common center of gravity unequal circles in a reciprocal proportion of the maſſes, the momenta given the bodies by the centrifugal force being equal, and (becauſe of their contrary directions) deſtroying another. But if either of the balls be removed farther from C than in the reciprocal proportion above-mentioned, that ball will gradually recede from the center of motion, and draw the other along with it, till it be ſtopped by the end of the piece V *v* or S *s*. So the earth and moon turn round one another, and round their common center of gravity, as has been already obſerved.

Exper. IV. (Plate XXXII. *fig.* 11.) On a piece of board A E K, which has a piece under it acroſs to raiſe up its broadeſt end A E to the angle of 15 or 20 degrees above the horizontal poſition, are faſtened 3 tubes A K, C K and E K, ſhut up at both ends. In the firſt there is a ſmall cylinder of cork, which can eaſily ſlide up and down the tube: in the tube C K there is a little cylinder of lead moveable in the ſame manner: and in the tube E K, there is an inch or two of quickſilver ſhut up. This board has a ſcrew under it, which going through one of the holes of the table (ſuch as are marked A and B in Plate XXXII. *fig.* 7.) is faſtened by a nut ſo as to join the board of tubes firmly to the table. Then when the cork, lead, and quickſilver are in that part of the tube next to the center of motion K; let the table be whirled round, and thoſe bodies will after a few turns be carried to the ends of the tubes which are fartheſt from the center, though 3 or 4 inches higher than the ends at K. Put on the tubes B K and D K, the firſt of which being filled with water has a cork cylinder moveable in it; and the other has in it an inch or two of oil, the other part of it being full of water. At firſt (when the table is at reſt) the cork and the oil will be at B and D the higher ends of the tubes and fartheſt from the center; but when the table is whirled round, the cork and the oil will go towards the center to K, becauſe the greater centrifugal force of the water (being greater than either that of the cork, or that of the oil) muſt give the cork and the oil a centripetal direction, as has been explained in the experiment of the different liquors in the glaſs of *fig.* 9.

CENTRIFUGAL MACHINE, a very curious machine, invented by Mr. Erſkine, for raiſing water by means of a centrifugal force, combined with the preſſure of the atmoſphere.

It conſiſts of a large tube of copper, &c. in the form of a croſs, which is placed perpendicular in the water, and reſts at the bottom on a pivot. At the upper part of the tube is a horizontal cog-wheel, which touches the cogs of another in a vertical poſition; ſo that by the help of a double winch, the whole machine is moved round with great velocity.

Near the bottom of the perpendicular part of the tube is a valve opening upwards; and near the two extremities, but on contrary ſides of the arms, or croſs part of the tube, are two other valves opening outwards. Theſe two valves are, by the aſſiſtance

of springs, kept shut till the machine is put in motion, when the centrifugal velocity of the water forces them open, and discharges itself into a cistern or reservoir placed there for that purpose.

On the upper part of the arms are two holes, which are closed by pieces screwing into the metal of the tube. Before the machine can work, these holes must be opened, and water poured in through them, till the whole tube be full: by this means all the air will be forced out of the machine, and the water supported in the tube by means of the valve at the bottom.

The tube being thus filled with water, and the holes closed by their screw caps, it is turned round by means of the winch, whence the water in the arms of the tube acquires a centrifugal force, opens the valves near the extremities of the arms, and flies out with a velocity nearly equal to that of the extremities of the said arms.

The above description will be very easily understood by the figure we have added on plate XXXII. *fig.* 12. which is a perspective view of the centrifugal machine, erected on board a ship.

A B C is the copper tube.

D, a horizontal cog-wheel, furnished with twelve cogs.

E, a vertical cog-wheel, furnished with thirty-six cogs.

F, F, the double winch.

a the valve near the bottom of the tube.

d, *b*, the two pivots on which the machine turns.

c, one of the valves in the cross piece; the other at *d*, cannot be seen in this figure, being on the other side of the tube.

e, *e*, the two holes through which the water is poured into the machine.

G H, the cistern, or reservoir.

I, I, part of the ship's deck.

The distance between the two valves *c*, *d*, is six feet. The diameter of these valves is about three inches; and that of the perpendicular tube about seven inches.

If we suppose the men who work the machine can turn the winch round in three seconds, the machine will move round its axis in one second; and consequently each extremity of the arms will move with a velocity of 88.8 feet in a second. Therefore a column of water of three inches diameter will issue through each of the valves with a velocity of 18.8 feet in a second: but the area of the aperture of each of the valves is 7.14 inches; which being multiplied by the velocity in inches = 225.6, gives 1610.784, cubic inches, the quantity of water discharged through one of the apertures in one second; so that the whole quantity discharged in that space of time through both the apertures is = 3221.568 inches; or 193294.08 cubic inches in one minute. But 6081.2 cubic inches make a tun, beer measure; consequently, if we suppose the centrifugal machine revolves round its axis in one second, it will raise nearly three tuns forty-four gallons in one minute; but this velocity is certainly too great, at least to be held for any considerable time; so that when this and other dificiencies in the machine are allowed for, two tuns in a minute is nearly the quantity that can be raised by it in one minute. And that this computation is near the truth appears from an experiment made on the 14th of May last, on board the Princess Mary at Woolwich, when the centrifugal machine was found to exceed the chain pump, at the rate of nineteen tuns and a half per hour; both being worked by an equal number of men. Now a good chain-pump will extract something more than a ton and a half in a minute, or about ninety tons in an hour.

It will perhaps be unnecessary to observe, that as the water is forced up the perpendicular tube by the pressure of the atmosphere, this machine cannot raise water above thirty feet high.

CENTRIPETAL FORCE is that force by which any body moving round another is drawn down or impelled towards the center of its orbit; and is much the same with gravity, whereby bodies tend towards the center of the earth; the magnetical attraction whereby it draws iron; and that force, whatever it be, whereby the planets are continually drawn back from right lined motions, and made to move in curves.

The centripetal and centrifugal force of the same revolving body, in the same point of the curve it describes, are always equal and contrary.

To determine what the law of centripetal force must be, is a problem of the greatest importance, and may be solved either by lineal, geometry, or by fluxions. In the first method it has been often done; but it is much more general and expeditious by the latter; therefore we shall give a general rule for determining the law of the centrifugal force.

Let B (Plate XXXIII. *fig.* 1.) be the place of the body moving in the orbit B F by a force directed to the given point C. Draw the tangent B Y, and the radius C B, C Q, infinitely near each other, Q R parallel to C B, and C Y, Q N perpendiculars to B Y. Let the distance C B = D, perpendicular C Y = P, then the infinitely small line Q R will be as the force and square of the time conjunctly, that is as the force and square of the area C B Q; therefore the force is as $\frac{QR}{CBQ^2}$ or $\frac{QR}{QB \times P^2}$, that is (because $P : D :: Q_n : QR = \frac{Q_n \times D}{P}$) as $\frac{Q_n \times D}{QB^2 \times P^3}$. But $\frac{QB^2}{2Q_n}$ = radius of curvature in the point B, and the same radius is also $\frac{DD}{P}$,

 where-

wherefore the force is as $\frac{\dot{P}}{2\,P^3\,\dot{D}}$ that is supposing $\dot{D}$ to be given) by the fluxion of $\frac{-1}{P^2}$.

Therefore to find the law of centripetal force, let D = distance from the center of force, P = perpendicular on the tangent: compute the value of P in terms of D, by the nature of the curve; then find the fluxion of $\frac{-1}{r^2 P}$, making $\dot{D} = 1$, and then expunge all the quantities as far as possible, except D, and you will have F, the law of centripetal force required. See the articles CENTRAL FORCES and CENTRIFUGAL FORCE.

CENTRO-BARYC, in mechanics, is the method of determining the content of a superficies or solid, by means of the center of gravity.

This method was first taken notice of by Pappus; but after him the jesuit Guildinus set this method in its full light, and shewed its use in a variety of examples.

Since Pappus and Guildinus, several other geometers have also used it in measuring solids, generated by a rotation round a fixed axis; especially before the method of fluxions was invented, which has in a great measure rendered this centro-baryc method of little use. However, the two following theorems, with the demonstrations and the corollaries, being part of a paper in the Mathematical Transactions, delivered in by Mr. Samuel Clark, may not be unacceptable to some of our readers.

Theor. I. Let G (Plate XXXII. *fig.* 13.) be the center of gravity of the space ABC, contained by the right-lines A B, B C, comprehending a right-angle, and the curve-line A D C of any kind whatsoever: From G, draw G X parallel to B C. Now if we conceive the said space to be divided into an infinite number of equal parts, by the lines F D, F D, F D, &c. drawn parallel to B C, then will the sum of the segments A F D, A F D, &c. be equal to the whole figure A B C D A, multiplied by X B.

Demonstration. Put n for the number of equal parts into which A B is divided, at the points F F F, &c. z the sum of the ordinates F D, F D, F D, &c. or area of the whole space, and let the parts A F D, F D, F D, &c. wherein the small letters a, b, c, d, e, &c. are placed, be represented by those letters; then B X the distance of the center of gravity, from the point of suspension B, will, by the principles of mechanics, be expressed by $\frac{na + \overline{n-1} \times b + \overline{n-2} \times c + \overline{n-3} \times d, \&c. \text{ --- } n}{z}$; but

$a + b + c + d$, &c. --- n = A B C
$a + b + c + d$, &c. --- $n - 1$ = A F D
$a + b + c + d$, &c. --- $n - 2$ = A F D

Whence the sum of the infinite number of segments equal to $na + \overline{n-1} \times b + \overline{n-2} \times c + \overline{n-3} \times d$, &c. continued until the number of terms is n, and is evidently equal to the above value of B X multiplied by Z. *Q. E. D.*

Theorem II. Things remaining as before, let the space A B C be made to revolve about the ordinate B C as an axis, by which a solid will be formed, whose content will be equal to the area of the said space, multiplied by the circumference of that circle, which the center of gravity G describes during one entire revolution of A B C about the axis B C.

Demonstration. The solid formed by the circumvolution of A B C about the axis B C, may be considered as made up of the upright surfaces of an infinite number of cylinders, whose perpendicular heights are the ordinates F D, F D, F D, &c. this being premised, let 1 to r express the ratio of the diameter to the circumference of a circle, then will the sum of such upright surfaces be equal to $2nar + \overline{n-1} \times 2rb + \overline{n-2} \times 2rc + \overline{n-3} \times 2rd$, &c. - - - n. But B X, the distance of the center of gravity from the ordinate BC, is equal to $\frac{na + \overline{n-1} \times b + \overline{n-2} \times c, \&c. \text{ - - - } n}{z}$; which being multiplied by $2r$, gives the periphery of the circle described by the center of gravity; this again multiplied by z, the area of A B C, produces $\frac{2nar + \overline{n-1} \times 2br + \overline{n-2} \times 2rc + \overline{n-3} \times 2rd, \&c.}{z} \times z$, which is certainly equal to $2nar + \overline{n-1} \times 2br + \overline{n-2} \times 2rc + \overline{n-3} \times 2rd$, &c. the content of the solid formed by the revolution of A C B about the axis B C. *Q. E. D.*

From these theorems the following corollaries are deduced.

Corollary I. The area of the space A B C, multiplied by G X, the distance of the center of gravity from A B, is equal to the sum of all the segments made by dividing A B C into an infinite number of equal parts, by right-lines drawn parallel to A B.

Cor. II. If the figure ABC revolves about the abscissa A B as an axis, the solid so formed will be equal to the area of the space A B C, multiplied by the circumference of that circle whose radius is G X, the distance of the center of gravity from A B.

Coroll. III. By having the area, and place of the center of gravity, of any curved or right-lined space given, we can cube the solid formed by the circumvolution of that figure, about either the ordinate or abscissa.

Coroll. IV. Having the magnitude of a solid, and the place of its center of gravity given, we can easily determine the area of the space by the circumvolution of which the said solid was produced.

CENTRUM, in geometry and mechanics, the same as center. See CENTER.

CENTRUM PHONICUM, in acoustics, the place where

where the ſpeaker ſtands, in polyſyllabic and articulate echoes.

CENTRUM PHONO-CAMPTICUM, the object or place that returns the voice in an echo. See the article ECHO.

Blancanus ſays, that no ſyllable can be diſtinctly and clearly returned, under the diſtance of twenty-four geometrical paces.

CENTRUM TENDINOSUM, in anatomy, a point wherein the tendons of the muſcles of the diaphragm meet.

CENTRY-BOX, the ſame with the guerritte, only the former is of wood, and the other of ſtone.

CENTUNCULUS, in botany, a genus of plants, whoſe flower is monopetalous and rotated, the tube being globoſe, and the limb divided into four oval ſegments. It contains four filaments, top'd with ſimple antheræ. The fruit is an unilocular globoſe capſule, containing a great number of ſmall roundiſh ſeeds.

CENTURION, among the Romans, an officer in the infantry, who commanded a century, or an hundred men.

CENTURY, in a general ſenſe, any thing divided into or conſiſting of an hundred parts.

CENTURY, in chronology, the ſpace of one hundred years. Church hiſtory is chiefly computed by centuries, beginning from our Saviour's birth.

CENTUSSIS, in Roman antiquity, a coin containing an hundred aſſes.

CEPA, the onion. See the article ONION.

CEPHALANTHUS, in botany, a genus of plants whoſe flowers are collected into a ſpherical head; each flower is monopetalous, and funnel-ſhaped. There are four filaments inſerted in the corolla, which are ſhorter than the tube. The fruit is a globular hairy capſule of one cell, incloſing one or two oblong angular ſeeds; ſeveral of theſe grow together, and form a round head.

CEPHALIC, in a general meaning, ſignifies any thing belonging to the head or its parts.

CEPHALIC MEDICINES, are remedies for diſorders of the head.

CEPHALIC VEIN, in anatomy, creeps along the arm between the ſkin and the muſcles, and divides it into two branches; the external goes down to the wriſt, where it joins the baſilica, and turns up to the back of the hand: the internal branch, together with a ſmall one of the baſilica, makes the mediana.

CEPHALOPHARYNGÆI, in anatomy, the firſt pair of muſcles of the upper-part of the gullet, which proceed from beſide the head and the neck, and are ſpread more largely upon the tunic of the gullet.

CEPHEUS, in aſtronomy, a conſtellation of the northern hemiſphere, whoſe ſtars, in Ptolemy's catalogue, are thirteen; in Tycho's eleven; in Hevelius's, forty; and in Mr. Flamſtead's, thirty-five.

CERASTES, the horned ſnake, in zoology, is the name of a ſpecies of ſerpent, with two protuberances on its forehead, hard as a ſhell, and from which it has its name.

CERASTIUM, in botany, a genus of plants, whoſe flower conſiſts of five bifid obtuſe petals, with ten filiform ſtamina, which are ſhorter than the corolla: theſe are terminated with roundiſh antheræ. The fruit is an ovato-cylindraceous capſule, of one cell, opening at the top, and contains a great number of roundiſh ſeeds. This genus is the ſame with the myoſotis of Tournefort.

CERATE, in pharmacy, the name of one of the ſorts of topical medicines, ſofter than a plaſter, and harder than an ointment.

CERATOGLOSSUM, in anatomy, the name of a pair of muſcles, ſerving to draw the tongue directly into the mouth; but if only one of them acts, it draws the tongue to one ſide of the mouth.

CERASUS, the cherry-tree. See the article CHERRY.

CERATONIA, the carob-tree, in botany, a plant which produces a petalous flower; the fruit is a compreſſed pod, of about a ſpan long, divided by tranſverſe partitions, each having a roundiſh compreſſed ſeed, contained in a brown-coloured ſweet pulp, which is uſed by the Egyptians and Arabians for the ſame intention as ſugar.

This tree is very common in Spain, and in ſome parts of Italy, as alſo in the Levant, where it grows in hedges, and produces great quantities of pods. Theſe are many times eaten by the poor inhabitants, when they have a variety of other food, but they are apt to looſen the belly, and cauſe gripings of the bowels. Theſe pods are directed by the college of phyſicians to enter ſome medicinal preparations; for which purpoſe they are often brought from abroad. With us it is raiſed in the gardens of the curious: the leaves are evergreen; and as they differ in ſhape from moſt other plants, they make an agreeable variety in the green-houſe. This plant is here propagated from ſeeds: they ſhould be ſown in the ſpring, on a hot-bed: when the plants are up, they ſhould be tranſplanted into pots, and afterwards inured by degrees to the open air, as the ſummer advances.

This plant is the ſame with the ſiliqua of Tournefort.

CERBERA, in botany, a genus of pentandrious plants, whoſe flower conſiſts of a pentaphyllous acuminated calyx; the corolla is monopetalous and funnel ſhaped, having a long tube open at the top, and divided into five large ſegments; in the middle of the tube are placed five ſubulated filaments, topped with erect antheræ. The fruit is a large round fleſhy drupe, marked with a longitudinal furrow on the ſide, and containing two cells, in each of which is a ſingle large compreſſed nut.

There

There are three ſpecies in this genus, one of which grows in the Braſils and the Spaniſh Weſt-Indies in plenty; alſo ſome in the Britiſh iſlands in America. This ſort riſes with an irregular ſtem to the height of eight or ten feet, ſending out many crooked diffuſed branches, which toward their tops are furniſhed with thick ſucculent leaves, about three inches long and near two broad, of a lucid green, ſmooth, and very full of a milky juice, as is every part of the tree. The flowers come out in looſe bunches at the extremity of the branches, and are of a cream colour. The wood of this tree ſtinks moſt intolerably, and the kernels of the nuts are a deadly poiſon, ſo that the Indians always caution their children againſt eating them, for they know of no antidote to expel this poiſon: nor will any of them uſe this wood for fuel; but they take the kernels out of the ſhells, into which they put ſmall ſtones, then bore a hole through each ſhell, and ſtring them, theſe they tie about their legs to dance with as the morrice-dancers uſe bells with us.

CERCIS, the Judas-tree, in botany, a plant which grows naturally in the ſouth of France. In Spain and Italy it riſes with an upright trunk to the height of twelve or fourteen feet, covered with a dark reddiſh bark, and divides upward into many irregular branches, which are furniſhed with round, heart-ſhaped ſmooth leaves, placed irregularly on the branches, with long foot-ſtalks: theſe are of a pale green on their upper, and of a greyiſh colour on their under-ſide, and are deciduous. The flowers come out on every ſide of the branches, and many times from the ſtem of the tree in cluſters; theſe are of a bright purple colour, papilionaceous, and ſtand on ſhort foot-ſtalks; the corolla of the flower conſiſts of five petals inſerted into the calyx; the fruit is an oblong obliquely acuminated legumen, having one cell, containing a row of roundiſh ſeeds, annexed to the upper ſurture.

This tree is uſually planted with us among other flowering trees and ſhrubs for the ornament of the flower-garden, and bloſſoms in May; it is propagated by ſowing the ſeeds in the ſpring upon a bed of light earth, and afterward tranſplanted into the nurſery.

The wood of this tree is very beautifully veined with black and green; it takes a fine poliſh, and may be converted into many uſes.

There is another ſpecies of cercis, which is a native of North America, where it is called the red-bud-tree.

CERBERUS, the name of a dog, with three heads, whom the poets made to be the porter of the infernal regions.

CERDONIANS, in church hiſtory, ancient heretics, who maintained moſt of the errors of Simon Magus, Saturnel, and other Gnoſtics.

CEREALIA, in antiquity, the ſacred rites of the goddeſs Ceres, inſtituted by Triptolemus.

CEREBELUM, in anatomy, the hinder part of the brain. See the article BRAIN.

CEREBRUM, in anatomy, denotes the brain. See the article BRAIN.

CEREMONY, *Ceremonia*, an aſſemblage of ſeveral actions, forms, and circumſtances, ſerving to render a thing more magnificent and ſolemn; particularly uſed to denote the external rites of religious worſhip, the formalities of introducing ambaſſadors to audiences, &c.

CERES, a Pagan deity, the inventor, or goddeſs of corn.

CEREUS, the torch-thiſtle, in botany, a genus of plants, whoſe flower is compoſed of a number of narrow pointed petals, which are radiated: in the baſe of the petals are inſerted a great number of declining ſtamina. The fruit is an oblong, ſucculent berry, with a prickly ſkin, filled with ſmall ſeeds, incloſed in a pulp.

There are divers ſpecies in this genus, ſome of which grow upright, others trail on the ground; but are all ſucculent, and without leaves.

The large upright torch-thiſtle has ſix large angles, which are far aſunder. Their edges are armed with ſharp ſpines, which come out in cluſters at certain diſtances, ſpreading like a ſtar. The outer ſubſtance of the ſtem is ſoft, herbaceous, and full of juice; but in the center there is a ſtrong fibrous circle, running the whole length, which ſecures the ſtem from being broke by the winds.

This plant will riſe to the height of thirty or forty feet, provided their tops are not injured. The flowers come out from the angles on the ſide of the ſtem, on a thick fleſhy footſtalk, which is ſcaly, round, channeled, and hairy. The duration of theſe flowers is very ſhort.

As this plant is houſed in winter, when it is got ſo high that the place cannot contain it any longer, it may be cut off near the bottom in the ſummer, and laid in the ſtove to heal the place of inciſion, after which it may be ſtuck in the bark-bed, where it will ſoon and readily take root; when it may be planted in a pot: the other part will put forth from the top freſh plants, which is the only method to increaſe them. This plant is not ſo tender as the other ſorts, therefore may be kept in a common green-houſe in winter; but they ſhould have ſcarce any water, for unleſs they are placed in a hot-houſe, where the moiſture is ſoon evaporated, the wet will occaſion them to rot. This ſpecies grows naturally at Surinam, from whence it was firſt brought to Holland, and is now very common in England.

Of the creeping or trailing ſorts, there is one which opens its flower in the evening, is fully expanded at midnight, and the next morning decayed. This is large and radiated.

Another ſort, which is now pretty common, produces very beautiful flowers, of a rich pink colour. The petals are not ſo numerous; and the tube of the

the flower is longer than thoſe of the other ſpecies; and contrary to all the other ſorts, keep open three or four days, provided the weather is not too hot. During the continuance of theſe flowers, which may be a fortnight or three weeks, as they do not all come out together, they make a moſt beautiful appearance in the houſe. This ſort has very ſlender trailing branches, which ſome train up to ſticks, which being turned in ſerpentine order, have ſomewhat the appearance of ſnakes; others let them hang down the ſides of the pots. This plant for the oddity of its appearance, and the great plenty of its beautiful flowers, may be placed among the firſt claſs of exotic plants. It is very eaſily propagated by cuttings in the ſummer months, which ſhould be laid in a dry place to heal for about a fortnight, and afterward ſtuck in the tan-bed, where they will eaſily take root; after which they may be potted, and kept in the hot-houſe in winter, though they may be preſerved with care in a good green-houſe; but muſt have very little water.

This genus of plants are claſſed by Linnæus with the melon, thiſtle, Indian-fig, &c. under the general name cactus: but though the flowers may agree, yet as the plants are ſo very different from each other in their appearance, we therefore thought it neceſſary in this work to explain them by the names they are moſt generally known by.

CERINTHE, honey-wort, in botany, a genus of plants, the flower of which conſiſts of a ſingle petal; the tube is ſhort and thick, the limb is thicker than the tube, and ſomewhat bellied: it is divided into five ſegments, and the mouth is open and pervious: the fruit conſiſts of two hard oſſeous bodies of an oval figure, gibbous on the outſide, plane within, acute, emarginated, and containing two cells: the ſeeds are ſingle, roundiſh, and accuminated.

Botaniſts enumerate five ſpecies of this genus, which are all natives of foreign countries.

CERINTHIANS, chriſtian heretics, followers of Cerinthus, who lived, and publiſhed his hereſy, in the time of the apoſtles themſelves; for Epiphanus places him in the year of Chriſt 80, in the reign of Domitian. He had been circumciſed, and was probably of Jewiſh extraction.

The particulars in which the hereſy of the Cerinthians conſiſted were theſe: they did not allow that God was the author of the creatures; but ſaid, that the world was created by an inferior power: they attributed to this creator an only ſon, but born in time, and different from the word. They admitted ſeveral angels and inferior powers, as ſilence, depth, fulneſs: in which they were afterwards followed by the Valentinians. They maintained that the law and the prophets came not from God, but from the angels; and that the God of the Jews was only an angel.

As to our Saviour, the Cerinthians diſtinguiſhed between Jeſus and Chriſt: they ſaid that Jeſus was a mere man, born like other men, of Joſeph and Mary; but that he excelled all others in juſtice, prudence, and wiſdom: that Jeſus being baptized, the Chriſt of the ſupreme God, that is, the holy ſpirit, deſcended upon him; and that, by the aſſiſtance of this Chriſt, Jeſus performed his miracles: that Jeſus ſuffered, and roſe again, but that the Chriſt had before left him, and returned to heaven.

CEROPEGIA, in botany, a genus of pentandrious plants, whoſe flower is compoſed of a ſmall quinquedented calx, with a monopetalous corolla, large and globoſe at the baſe, with a cylindraceous tube, and a ſmall limb, cut in five ſegments: in the baſe of the corolla is placed five ſmall incurved ſtamina. The pericarpium is compoſed of two cylindraceous pointed folliculi unilocular, and of one valve. The ſeeds are numerous, imbricated, oblong, and crowned with down.

CERTIFICANDO DE RECOGNITIONE STAPULÆ, a writ iſſued to the mayor of the ſtaple, commanding him to certify to the lord-chancellor a ſtatute-ſtable taken before him, where the party refuſes to bring it.

CERTIFICATE, in law, a writing made in any court, to give notice to another court of any thing done therein. The clerks of the crown, aſſize, and the peace, are to make certificates into the King's-Bench, of the tenor of all indictments, convictions, outlawries, &c.

CERTIFICATION *of Aſſize of novel Diſſeiſin*, a writ granted for re-examining paſſed-by aſſizes, before juſtices. This writ is uſed where a perſon appears, by his bailiff, to an aſſize brought by another, and has loſt the day.

CERTIORARI, a writ which iſſues out of the chancery, directed to an inferior court, to call up the records of a cauſe there depending, in order that juſtice may be done: and this writ is obtained upon complaint that the party who ſeeks it has received hard uſage, or is not like to have an impartial trial in the inferior court. A certiorari is made returnable either in the King's-Bench, Common-Pleas, or in Chancery.

CERT-MONEY, a fine paid yearly by the reſidents of ſeveral manors to the lord thereof, and ſometimes to the hundred, *pro certa lete*; that is, for the certain keeping of the leet.

CERVICAL NERVES, in anatomy, are eight pair of nerves, ſo called, as having their origin in the neck. See NERVE.

CERVICAL VESSELS, in anatomy, denote the arteries, veins, &c. which paſs through the vertebræ, and muſcles of the neck, up to the ſkull.

CERVICALES DESCENDENTES, a pair of muſcles, antagoniſts to the ſacro-lumbares, coming from the third, fourth, fifth, and ſixth vertebræ of the neck.

CERVIX, in anatomy, denotes properly the hinder

hinder part of the neck, as contradiſtinguiſhed from the fore part, called *jugulum*, or the throat. See NECK.

CERVIX *of the Uterus*, or the neck of the uterus, that oblong canal or paſſage between the internal and external orifices of the womb, which receives and incloſes the penis, like a ſheath; whence it is alſo called vagina. See the articles UTERUS and VAGINA.

CERUMEN, ear-wax, or that natural excrement collected in the meatus auditorius, and diſcharged from the glands of thoſe parts through the membrane which lines them. It is fluid on its firſt diſcharge, but by its continuance it becomes thicker, more ſolid, viſcid, of the conſiſtence of clay, and of a bitteriſh taſte.

CERUSE, or CERUSS, white-lead, a ſort of calx of lead, made by expoſing plates of that metal to the vapour of vinegar.

CERUSS *of Antimony*, a medicine prepared by diſtilling powdered regulus of antimony with ſpirit of nitre, till no more fumes ariſe; what remains in the retort, being pulveriſed and waſhed, makes the ceruſs of antimony, which is eſteemed a powerful diuretic.

CERVUS, the ſtag or deer-kind, in zoology, a genus of quadrupeds of the order of the pecora; the characters of which are, that they have deciduous horns, at firſt hairy, and afterwards naked and ſmooth; add to this, that there is only one dog-tooth on each ſide of the upper jaw, and that placed at a diſtance from the other teeth.

Under this genus are comprehended the camelopardalis, the alce or elk, the rangifer or rein-deer, the capreolus, and the ſtag and fallow-deer. See the articles CAMELO-PARDALIS, &c.

CERVUS VOLANS, in zoology, the name of the ſtag-horned beetle, a remarkably large ſpecies of beetle, with its horns deeply jagged or ramified, ſomewhat like thoſe of a ſtag.

CESARE, among logicians, one of the modes of the ſecond figure of ſyllogiſms, the minor propoſition of which is an univerſal affirmative, and the other two univerſal negatives: thus

CE. No immoral books ought to be read:
SA. But every obſcene book is immoral:
RE. Therefore no obſcene book ought to be read.

CESSION, in law, an act by which a perſon ſurrenders and tranſmits to another perſon, a right which belonged to himſelf.

CESSION, in the eccleſiaſtical law, is when an eccleſiaſtical perſon is created a biſhop, or when a parſon of a pariſh takes another benefice without diſpenſation, or being otherwiſe qualified. In both theſe caſes their firſt benefices become void by ceſſion, without any reſignation.

CESTRUM, in botany, a genus of plants, the flower of which is monopetalous, of a funnel-form, with a cylindrical and very long and ſlender tube, and a plane plicated limb, divided into five equal ovated ſegments; the fruit is an oblong oval berry, with one cell, containing numerous roundiſh ſeeds.

CESTUS, among ancient poets, a fine embroidered girdle ſaid to be worn by Venus, to which Homer aſcribes the faculty of charming and conciliating love.

CETACEOUS, an appellation given to a claſs or order of fiſhes, otherwiſe called plagiuri. See the article PLAGIURI.

CETERACH. See the article ASPLENIUM.

CETUS, *or the Whale*, in aſtronomy, a conſtellation of the ſouthern hemiſphere, containing, according to Ptolemy, 22 ſtars, Tycho 21, but in the following catalogue 97. The poets tell us that this is that monſtrous fiſh that would have devoured Andromeda; but, being overcome by Perſeus, was afterwards tranſlated into heaven by Jupiter, for the hugeneſs of its bulk.

Order.	Magn.	Name.	Bayer Let.	Right Aſcenſion	Diſtance from Nor. Pole.	Var. in Right Aſcen.	Var. in Declination.
				° ′ ″	° ′ ″	″	″
1	6			356.14.27	107.10.44	44. 7	20.0
2	4.5		g	357.51.20	109.40.42	44. 5	20.0
3	6			358. 2.10	101.50.56	44. 2	20.0
4	6			359. 6.40	93.53.16	44. 0	20.0
5	6			359.13.42	93.47.11	44. 2	20.0
6	5		f	359.46. 7	106.47.20	46.13	20.0
7	5		b	0.36.33	110.16. 6	44. 5	20.0
8	3		i	1.46.56	100. 9.45	46. 4	20.0
9	6			2.38.31	103.32.55	44. 0	20.0
10	6			3.35. 6	91.23.10	44. 0	20.0
11	6			4.22.53	92.26.57	44. 0	20.0
12	6			4.26.21	95.17.31	44. 0	20.0
13	6			5.42.48	94 55.25	44. 0	19.9
14	6			5.47 22	94.49 41	44. 0	19 9
15	6		g	6.27.21	91.50 11	44. 0	19.9
16	3			7.52.47	109.18.35	45. 5	19.9
17	5	1ma ad	φ	8. 1.29	101.56.11	44. 0	19.8
18	6		φ	8.20 55	104.11. 2	43. 5	19.8
19	5	2da ad		9.32. 1	101.56.36	43. 5	19.8
20	6			10. 1.37	92.27.22	44. 0	19.8
21	6		φ	10.32.37	100. 1.39	43. 5	19.8
22	5	3tia ad	φ	10.59.57	102.34.31	43. 5	19.7
23	5	4ta ad		11.41.45	102.40.54	43. 5	19.7
24	6			12. 9.54	85.38. 5	44. 5	19.7
25	6			12.46. 1	96. 7.17	44. 0	19.7
26	6			12.53.39	89.55.39	44. 5	19.7
27	6			13.23.42	101.15.59	43. 2	19.7
28	6			13.30.32	101. 8. 4	43. 2	19.7
29	6			13.54.56	89.15.41	44. 0	19.7
30	6			13.55.22	101. 3.20	43. 5	19.7
31	3		μ	14. 7.49	101.27.55	43. 5	19.6
32	6			14.32.23	100.11.15	43. 5	19.6
33	6			14.33.56	88.50.16	44. 0	19.6

Order.	Magn.	Name.	Bayer Let.	Right Aſcenſion.	Diſtance from Nor. Pole.	Var. in Right Aſcen.	Var. in Declination.
				° ′ ″	° ′ ″	″	″
34	6			15.55. 2	93.31.55	43. 7	19.5
35	6			15. 4. 9	89.48. 0	44. 0	19.5
36	6			15.10.34	98. 4. 0	43. 5	19.5
37	5			15.34.25	99.13.52	43. 2	19.4
38	6			15.39.12	92.14.49	44. 0	19.4
39	6			16. 6.19	93.46.11	43. 7	19.4
40	6			16. 9.49	93.32.21	43. 7	19.3
41	6			16.24.24	98.56. 3	43. 5	19.3
42	6			16.53.59	91.46.41	44. 0	19.2
43	6			17.35.15	91.43.54	44. 0	19.2
44	6			17.57. 6	99.15.38	43. 0	19.2
45	3		θ	18. 0,31	99.25.58	45.15	19.1
46	5			18.27.20	105.51.11	42. 5	19.1
47	6			18.45.28	104.18.41	42. 5	19.1
48	6			19.30.28	113.52.37	40. 6	19.0
49	6			20.43.30	106.54.44	42. 0	19 0
50	6			21. 4.31	106.37. 2	42. 0	19.0
51	6			22.14. 7	85.45.11	44. 5	18.9
52	3.4		τ	23.15.32	107.13.18	41. 0	18.9
53	5		χ	24.26. 5	101.52.51	41. 5	18.9
54	6			24.46.51	80. 8.54	45. 2	18.8
55	3	1ma ad	ξ	24.54. 7	101.31.55	41. 5	18.8
56	4	1ma ad	υ	26.21.26	113.42. 8	40. 5	18 7
57	5			27. 7. 7	112. 1.33	40. 7	18.7
58	6			27.12.10	93.14.52	43. 5	18.6
59	4.5	2da ad	υ	27.10. 4	112.14.27	40. 5	18.6
60	6			27.43.27	91. 2.41	44. 0	18.5
61	7			27.52.59	91.30.32	44. 0	18.5
62	6.7			29.14.34	93.28.54	43. 5	18.4
63	6			29 36.10	92.58. 5	43. 5	18.3
64	6			29.40.30	82.33.20	45. 2	18.2
65	6	1ma ad	ξ	30. 4. 4	82.17. 2	47. 2	18.1
66	6			30. 6.49	93.31.29	43. 5	18.0
67	6			31.13.22	97.32.15	42. 5	18.0
68	3.2	In Peſtore	o	31.48.27	94. 4.17	45. 4	17.9
69	6	Nova		32.25.14	90.42.59	44. 0	17.5
70	6			32.28.44	91.58.30	43. 7	17 0
71	6			33.12.11	93 52.39	43. 2	16.9
72	4		ρ	33 35.39	103.22.47	41. 5	16.8
73	5.4	2da ad	ξ	33.50.22	82.37.39	45. 2	16.5
74	6			34. 1.57	112.54.44	40. 0	16.5
75	5.6			34.58.58	92. 6.45	43. 7	16.4
76	4		σ	35.10.21	106.18. 1	41. 0	16.4
77	6			35.42.12	98.55. 8	42. 2	16.4
78	4.5		ν	35.48.58	85.26.54	45. 0	16.3
79	6			35.48.59	94.35.28	43. 0	16.2
80	6			36. 2.12	98.53.20	42. 2	16.1
81	6			36.23.45	94.27.10	43. 0	16.0
82	3		δ	36.48.29	92.43.28	46. 0	16.0
83	3		ε	37. 0.10	102.53.41	43. 7	15.9
84	6			37.13.47	91.44.13	44. 0	15.5
85	6			37.24.21	80.17.53	46. 0	15.0
86	3		γ	37.43.14	87.47.30	44. 5	15.0
87	4		μ	37.58.40	80.55.14	46. 0	14.9
88	6			38. 0. 1	78.34.29	46.5	14.8
89	4.3		π	38.10.22	104.53.19	41.0	14.8
90	8			38.28.27	109.36.14	40.0	14.7
91	4		λ	41.42. 5	80. 4. 9	46.0	14.7
92	2		α	42.26.21	86.52.11	46.7	14.7
93	6			42.27. 2	86.37. 3	44.7	14.5
94	6			45. 8.12	92. 6.44	43.7	14.3
95	6			46 31.25	91.49.27	43.7	14.2
96	5	1ma ad	κ	46.40.54	87.21.45	44.5	14.1
97	4	2da ad	κ	47.17.59	87.12.26	44.5	14.0

CEVADILLA, in botany, Indian cauſtic barley, the ſeed veſſel of a Mexican plant, reſembling in its form and ſtructure a barley ear, but with ſmaller ſeeds, not above the ſize of linſeed.

CHÆROPHYLLUM, chervil, in botany, an umbelliferous plant, with winged leaves ſomewhat like thoſe of parſley, producing ſmooth longiſh ſeeds, ſhaped like a bird's beak. It is a native of the ſouthern parts of Europe, and ſown annually with us in gardens.

CHAFERY, a forge in an iron-mill, where the iron is hammered out into complete bars, and brought to perfection.

CHAFE-WAX, an officer in the chancery, who fits the wax for ſealing writs, patents, and other inſtruments iſſued out from thence.

CHAFF, in huſbandry, the refuſe or ſtraw that is ſeparated from corn, by ſereening or winnowing it.

CHAFFERCOUNCES, printed linen manufactured in the Mogul's dominions, and imported to Europe by way of Surat.

CHAFFEZS, in our old records, ſignify wares or merchandize; and hence the word chaffering is uſed for buying and ſelling.

CHAIN, *Catena*, a long piece of metal compoſed of ſeveral links, or rings, engaged the one in the other. They are made of divers metals, ſome round, ſome flat, others ſquare; ſome ſingle, ſome double; and ſerve for ſo many uſes, that it would be tedious to give a particular account of them all.

CHAIN alſo implies a ſtring of gold, ſilver, or ſteel-wire, wrought like a tiſſue, which ſerves to hang watches, tweezer caſes, and other valuable toys upon. The invention of theſe piece of workmanſhip was derived originally from England, whence foreigners give them the name of chains of England.

CHAINS, in naval affairs, ſtrong plates or links of iron bolted to the timbers on each ſide of all the maſts, by which the ſhrouds of the maſts are drawn tight and faſtened. There is a broad plank or thick ſcaffold,

ſcaffold, called the channel, placed edge-ways on the ſhip's ſide, through which they paſs in order to keep the ſhrouds off the upper-rails and gunnels; that is, the upper part of the ſhip's ſide.

CHAIN-SHOT, in artillery, is formed by having a ſhort chain which faſtens two cannon-balls together. Theſe are more particularly uſed in the ſea-ſervice for cutting and mangling a ſhip's rigging, and carrying away her maſts.

CHAIN-PUMP. See the article PUMP.

CHAIN, in ſurveying, an inſtrument uſually made of iron-wire, but ſometimes of braſs, divided into an hundred equal parts, called links, and is uſed in meaſuring lengths in ſurveying of land; and if other proper inſtruments for taking or meaſuring angles are wanting, it may be uſed with great propriety for that purpoſe, and rather preferable to any other for expedition, accurateneſs, where the bearings are not required, or an accurate plot is not wanted, but only the true content of a piece of land. Theſe chains are of different or various ſorts, viz.

1. A chain of 100 feet long, each link conſequently one foot long; at each tenth foot there is a plate of braſs with a figure engraved upon it, ſhewing readilly how many links are from the beginning of the chain; and for more eaſe in reckoning, there is, or ſhould be a braſs ring at every five links, that is one between every two plates.

2. A chain of 16½ feet long, and made ſo as to contain a hundred links, with rings at every tenth link. This chain is moſt uſeful in meaſuring gardens or orchards by pole or perch meaſure.

3. A chain of four poles or perches in length, called Gunter's chain, being ſixty-ſix feet, or twenty-two yards, which being divided into one hundred parts, or links, each link conſequently muſt contain 7,92 inches. It is uſual to put pieces of braſs at every tenth link, and that at the fiftieth link is round, but all the reſt are forked, or cut with points. Thus at ten links, from the beginning, is a piece of braſs with one horn or point; at twenty with two, at thirty with three, at forty with four, and at fifty a round piece. Likewiſe it muſt be remarked, that it does not proceed from from fifty to ſixty, but from each end to fifty. This chain is what is commonly uſed by ſurveyors, and is of all others moſt uſeful. Sometimes inſtead of the forked points abovementioned in the pieces of braſs, they are all made round, with each a proper number of holes to diſtinguiſh them, but theſe are not ſo good, the holes being apt to fill with dirt, and cauſe miſtakes, which in every thing ought carefully to be avoided as much as poſſible.

When any line, ſide of a field, &c. is to be meaſured with this chain, you need not regard any other denomination but chains and links, which ſet down in the ſame manner as decimals: thus, if the ſide or line meaſured be 7 chains, 47 links, you muſt write it down thus, 7.47, which is nothing more than expreſſing it decimally ſeven chains, and for ſeven one-hundredths. Again, if it was fifteen chains nine links you had to put down, write it thus, 15.07, always remembering, if the links to be writ down are under ten, to place a cypher before the quantity, as in the laſt.

The method of ſurveying a field or piece of land with the chain, we ſhall ſhew by the following example, viz.

Let A B C D E F repreſent the field, whoſe content is required. Firſt, Draw a rough ſketch of the outlines of the place by the eye, likewiſe of the pricked lines, as repreſented in the figure. Second, Set off with the chain any convenient number of links, as 30, 40, or 50, from A to *c*, and the ſame from A to *d*; then meaſure from the point *c* in the line A C to the point *d* in the line A F, and you have the chord *c d* of the angle A *d*. Third, Meaſure the line A *a* with the chain. Fourth, Meaſure *a* B, ſo that it ſhall be perpendicular to A C, which you may eaſily do with a croſs-ſtaff; then proceed to meaſure the line *a* C, C D, D *b*, *b* E, (in the ſame manner as *a* B) and *b* F, and you will have all the dimenſions required for either plotting the field, or finding the true content; the nature of which, and every other requiſite, ſhall be given under the article SURVEYING.

CHAIR, *Cathedra*, was anciently the ſuggeſtum, or pulpit, whence the prieſt or public orator ſpoke to the people. See the article CATHEDRA.

Curule CHAIR, an ivory ſeat placed on a car, wherein were ſeated the chief magiſtrates of Rome, and thoſe to whom the honour of a triumph was granted.

CHAIR-MAN, the preſident or ſpeaker of an aſſembly. See PRESIDENT.

CHALAZA, among naturaliſts, a white knotty ſort of ſtring at each end of an egg, formed of a plexus of the fibres of the membranes, whereby the yolk and white are connected together. See EGG.

CHALCEDONY, *Chalcedonius*, in natural hiſtory, a genus of ſemi-pellucid gems, of an even and regular, not tabulated texture; of a ſemi-opake, cryſtalline baſis, and variegated with different colours, diſperſed in form of miſts and clouds; and, if nicely examined, found to be owing to an admixture of various kinds of earths, but imperfectly blended in the maſs, and often viſible in diſtinct moleculæ.

CHADCIDICA, or CHALCIDICUM, in ancient architecture, a magnificent hall belonging to a tribunal or court of juſtice.

CHALCITIS, the name given by the ancients to the browniſh-red chalcanthum, of a ſoft and friable ſubſtance, and ſhewing a very irregular ſurface when broken; being compoſed of five or ſix ſeries of ſhort, waved, and undulated ſtriæ.

CHAL-

CHALDRON, an Engliſh dry meaſure, conſiſting of thirty-ſix buſhels, heaped up according to the ſealed buſhel kept at Guild-hall, London: but on ſhip-board, twenty-one chaldron of coals are allowed to the ſcore.

CHALICE, the cup or veſſel uſed to adminiſter the wine in the ſacrament; and by the Roman catholics in the maſs.

CHALK, in natural hiſtory, the Engliſh name of the white, dry marle, with a duſty ſurface, found in hard maſſes, and called by authors, *creta*, and *terra creta*.

Black CHALK, among painters, denotes a kind of ochreous earth, of a cloſe ſtructure, and fine black colour, uſed in drawing upon blue paper.

Red CHALK, an indurated clayey ochre, common in the colour-ſhops, and much uſed by painters and artificers.

CHALKY-LAND, that lying on a chalky bottom, whereby it is ſtrongly impregnated with the virtues of the chalk.

CHALLENGE, a cartel, or invitation to a duel, or other combat. See the article DUEL.

CHALLENGE, in law, is an exception made to jurors, who are returned to a perſon on a trial.

CHALYBEAT, in medicine, an appellation given to any liquid, as wine or water, impregnated with particles of iron or ſteel.

CHAMADE, in war, a ſignal made by beat of drum for a conference with the enemy, when any thing is to be propoſed; as a ceſſation of arms to bring off the dead, or a ſignal made by the beſieged when they have a mind to deliver up a place upon articles of capitulation: in which caſe there is a ſuſpenſion of arms, and hoſtages delivered on both ſides.

CHAMÆDRYS, in botany. See TEUCRIUM.

CHAMÆLEON, *Chamæleo*, in zoology, a ſpecies of lizard with a ſhort rounded tail, five toes on each foot, two or three of which adhere together. See LIZARD.

CHAMÆMELUM, camomile, in botany, a plant with finely divided leaves; and moderately large flowers, ſtanding ſolitary on the tops of the ſtalks, upon long naked pedicles: the flower is compoſed of a number of white petala, ſet round a yellow convex diſk.

The leaves and flowers of this plant have a ſtrong, not ungrateful ſmell; and a very bitter nauſeous taſte.

CHAMÆPITYS, ground-pine, in botany, a low, hairy, creeping plant, with ſquare ſtalks; whitiſh clammy leaves, cut deeply into three long narrow ſegments, like thoſe of the pine-tree, ſet in pairs at the joints; and yellow labiated flowers, without pedicles, and wanting the upper lip. It is annual, grows wild in ſandy and chalky grounds in ſome parts of England, and flowers in July.

CHAMÆROPS, the dwarf palm or palmetto, in botany, a plant which has no ſtem, but the foot-ſtalks of the leaves riſe immediately from the root, and are armed on each ſide with ſtrong ſpines; they are flat on their upper ſurface and convex underneath. To the ends of theſe foot-ſtalks the center of the leaves are faſtened, which ſpread open like a fan, having many foldings, and at the top are deeply divided like the fingers of the hand; when they firſt come out they are cloſed together like a fan when ſhut, and are faſtened together by ſtrong fibres, which run along the borders of the leaves; when the leaves ſpread open, theſe fibres or ſtrings hang from the ſides and ends; the borders of the leaves are finely ſawed with narrow edgings; theſe leaves ſpread out on every ſide of the plant.

From between the leaves comes out the ſpadix or club which ſuſtains the flowers: this is covered with a thin ſpatha or hood, the flowers are male and hermaphrodite; the petals are ovated, erect, acute, and inflected at the top. The fruit conſiſts of three round berries with one cell, containing ſolitary globoſe ſeeds.

The corolla of the male flower is the ſame as the hermaphrodite.

This plant grows naturally in Andaluſia, where in ſandy land the roots ſpread, and propagate very faſt, as fern does in England. The leaves of this plant are uſed as brooms to ſweep with. Another ſort of palmetto grows naturally in the Weſt-Indies, which differs chiefly in the ſize, and are without ſpines.

CHAMANIM, in Jewiſh antiquity, idols expoſed to the ſun upon tops of houſes, according to Rabbi Solomon: others will have the chamanim to be the ſame with what the Greeks call pyræa; that is, portable chapels, or temples, made in the form of chariots, in honour of the ſun. See the article PYRÆA.

CHAMBER, in building, any room ſituated between the lowermoſt and the uppermoſt rooms: in moſt houſes there are two, in others three, or more ſtories of chambers.

CHAMBER, in policy, the place where certain aſſemblies are held, alſo the aſſemblies themſelves. Of theſe, ſome are eſtabliſhed for the adminiſtration of juſtice, others for commercial affairs.

CHAMBER *of a Cannon*, in artillery, that part of the bore of a cannon which receives the powder with which it is charged. See the article CANNON.

It is evident that the greater the quantity of powder which takes fire at the ſame inſtant, the greater its effect will be upon the bullet. This gave riſe towards the end of the laſt century, to a new conſtruction of the bore of cannon, by making a cavity in the form of a ſphere a *little flatted*. The touch-hole being placed pretty near the middle of this cavity, which was larger than any other part of

the bore, fired a greater quantity of powder at the same time than if the bore had been uniform, and then the powder finding itself, as it were, bound up, and confined in this cavity, acted upon the bullet with more force and impetuosity than in the common pieces.

The design of this contrivance was to throw a bullet from a piece shorter, lighter, and more easy of carriage, than others, with the same degree of force as from those before used. Experience proved that the construction of these pieces answered the end proposed; for though much shorter than other cannon, and charged with a less quantity of powder, they produced the same effect. But as it was difficult to clean the chamber after the piece had been fired, there frequently remained some sparks behind; so that when it was necessary to fire the pieces as fast as possible, many cannoneers had their arms shot off as they were charging them; and besides, as the powder, before it forced itself out of the chamber pressed on all sides with great violence and impetuosity, in a very little time the carriages were broken to pieces, and rendered unserviceable; and by a frequent repetition of this violent agitation, the piece acquired a very considerable recoil, and the direction of the bullet became uncertain. For these reasons this contrivance was entirely laid aside, and the greatest part of these pieces found in the arsenals and fortifications were re-cast; so that the cannon now used have a bore of the same diameter in all parts.

The pieces with spherical or oblong cavities, were called *spherical chamber-pieces*; and those used before and since that invention, are called *cylindrical chamber-pieces*.

We have already said, that the bore of cannon is in every part of equal diameters, but it must be observed, that this is not strictly true at present, except in twelve, eight, and four pounders; for in twenty-four and sixteen pounders, there is made at the bottom of the bore a little cylindrical chamber *a*, *b*, in *fig.* 2. Plate XXVII. which holds about two ounces of powder.

CHAMBER *of a Mine*, the furnace or cavity at the inner end of the mine that receives the charge of powder, by which it is blown up. See the articles CHARGE, GALLERY, MINE.

The design of mines is to blow up and destroy whatsoever lies over their chambers; and in order to this, it is necessary that the powder they contain should meet with less resistance in this part than towards the gallery, otherwise it would not blow up.

When the quantities of powder requisite to charge the mine is known, what ought to be the dimensions or capacity of its chamber is to be thence ascertained.

The chamber must be of a size just sufficient to contain the charge it is to receive, that the powder being more confined, may, when inflamed, have a stronger effect. It must also be of the figure of a cube, that is, a solid terminated by six equal squares, because the powder taking fire in the middle of this solid, acts more equally on all parts of the chamber of the mine, than if it had any other figure, except it could be made circular, which would be still better, but the construction of it in this figure is too difficult.

The proper dimensions of the chamber may be easily determined by geometry, knowing only the weight of a cubic foot of powder, which is found to be about eighty pounds; as, for instance, if a mine is to be charged with eighty pounds of powder, its chamber must be equal to one cubic foot. It may however be made about one-third larger than the space filled by the powder, because, to prevent the powder from growing damp in the chamber, or furneau, it is covered all round with sacks, planks, straw, &c.

To fix then the proper dimension of the chamber of the mine, for which we have above ascertained the proper charge, let us suppose, that to ninety-three pounds and an half, the quantity given by the calculation, seven pounds and a half be added, there will then be one hundred pounds complete for the charge. Now if eighty pounds of powder occupy one cubic foot of space, one hundred pounds will occupy one cubic foot and one quarter; add to this three quarters of a foot for the sacks, planks, straw, &c. which are to be placed in the mine, and two cubic feet will be given for the whole capacity of the chamber. So that nothing more is requisite than to find the side of a cube, containing two cubic feet, which appears by approximation, to be about one foot three inches; and then giving for the base of the chamber a square, whose side is equal to that just found, and making its height also equal to the same, it will have exactly the dimensions required. It may not be amiss to observe, that a rigorous exactness is not absolutely necessary in this sort of calculation.

CHAMBER *of a Mortar*, is situated in the same place, and destined for the same purpose, as the chamber of a cannon explained above. See the articles BOMB and MORTAR.

Some mortars have cylindrical chambers, which they call *old fashion*; some have spherical chambers, others chambers in the shape of a pear; there are others with chambers shaped like the frustum of a cone.

The mouths of mortars are from six to eighteen inches diameter; the chambers are bigger or less, according to the size of the piece, and they contain from two to twelve, and even to eighteen pounds of powder.

CHAMBER *of a Pump*. See the article PUMP.

CHAMBRANLE, among builders, an ornament of stone or wood bordering the three sides of doors, windows,

windows, and chimnies. It is different, according to the several orders, and consists of three parts, viz. the top called the traverse, and the two sides, the ascendants.

CHAMFER, or CHAMFRET, in architecture, an ornament consisting of half a scotia, being a kind of a small furrow or gutter on a column, called also scapus, stria, &c.

CHAMFERING, in architecture, a term used for the cutting the under edge of any thing aslope or level.

CHAIMOIS, or CHARMOIS-GOAT, in zoology, the name of the rupin capra, a creature of the goat-kind, with erect and short but hooked horns.

It is from the skin of this animal that the chamois leather is made.

CHAMPADA, in botany, a genus of trees, producing polypetalous flowers, which are succeeded by a large fruit resembling a melon, much prized by the people of Malacca; it is when ripe twelve or fourteen inches long, and as much in circumference where broadest.

CHAMPAIN, or *Paint* CHAMPAIGN, in heraldry, a mark of dishonour in the coat of arms of him who kills a prisoner of war, after he has cried quarter.

CHAMPARTY, or CHAMPERTY, in law, a contract made with either the plaintiff or defendant in any suit at law, for giving part of the land, debt, &c. sued for, to the party who undertakes the process at his own proper charges, provided he succeeds therein.

CHAMPIGNON, a plant of the fungus kind; it is less than the mushroom, pitted all round, and of a whitish red or brown; it is hollow on the inner side, and seems to be sprinkled with a sort of mealiness; though it is smooth, it differs from the common mushroom, not only in the size, but by the cavities, as well as by the colour of the under side.

The pedicle is entirely white, hollow, and furnished at the end with slender thready roots. The champignon, as well fresh as dried, has a sweetish taste, and is prepared in various manners for the table. Geoffroy affirms, it excites the appetite, increases the motion of the blood, and restores the strength, though it yields but little nourishment. They are in great esteem among the French, though some think all funguses are bad.

Champignons are found in meadows, and on commons in divers parts of England, and frequently grow in circles.

CHANCE, in a general sense, a term applied to events, not necessarily produced, as the natural effects of any proper foreknown cause.

CHANCE is more particularly used for the probability of an event, and is greater or less, according to the number of chances by which it may happen, compared with the number of chances by which it may either happen or fail.

Doctrine of CHANCE, or *Laws of* CHANCE, is that art or method, by which (from certain rules) we discover the probability that any event has of happening or failing. Thus, supposing it were required to express the probability of throwing either an ace or duce at the first throw with a single die; then there being in all six different chances or ways that the die may fall, and only two of them for the ace or duce to come upward, the probability of the happening of one of those will be $\frac{2}{6}$, or $\frac{1}{3}$, and that of the contrary $\frac{4}{6}$, or $\frac{2}{3}$.

Or more generally, supposing there be a, chances for the happening of an event, and b chances for the contrary; then the probability of happening will be $\frac{a}{a+b}$, and that of failing $\frac{b}{a+b} = 1 - \frac{a}{a+b}$. From hence it appears, that if the probability of the happening of an event, be subtracted from the unity, the remainder will be the probability of its failing; and *vice versa*.

The expectation on an event, is considered as the present certain value or worth, of whatever sum or thing is depending on the happening of that event, and is composed of that sum, and the probability of obtaining it. Therefore if the expectation on an event be divided by the value of the thing expected on the happening of that event, the quotient will be the probability of happening. For example, suppose A to throw once with a single die, on condition, that if either an ace or duce comes up, he shall be entitled to twenty shillings; then the probability of his receiving the said sum is $\frac{1}{3} \times 20$ s. or $\frac{1}{3}$ of 20s. will be the expectation in this case.

Again, suppose it was required to find the probability that two assigned events should both happen. Let the probability of the happening of the first of the two events be denoted by $\frac{a}{a+b}$, and that of the second by $\frac{c}{c+d}$; and suppose the happening of both to entitle a person B to the sum S. Now if the first of these should happen, it is manifest, that from that time till the second is determined, the expectation of B will be $\frac{c}{c+d} \times$ S, or so much is the sum that he might in that circumstance receive as an equivalent for his chance of obtaining that sum S. But his probability of getting into this circumstance, or being entitled to the value $\frac{c}{c+d} \times$ S, being only $\frac{a}{a+b}$, this expectation therefore, before either of the events is decided, can be only $\frac{a}{a+b}$, part of $\frac{c}{c+d} \times$ S, or $\frac{a}{a+b} \times \frac{c}{c+d} \times$ S; therefore the required

quired probability of receiving it, or of both the events happening, is only $\frac{a}{a+b} \times \frac{c}{c+d}$, that is, the probability that any two assigned events shall both happen, will be equal to the product of the probabilities of the happening of those events considered seperately.

Coroll. Wherefore since the probability of the happening of each of these events may be compounded of the probabilities of the happening of two others, as well as that of receiving the sum S is of them two, &c. it follows, that the probability of the happening of any given number of events, i. e. that they shall happen, is equal to the product of all the probabilities of happening of those events considered singly.

For the manner of applying the doctrine of chances to gaming and annuities, see GAMING and INTEREST.

CHANCEL, a particular part of the fabric of a Christian church; or that part of the choir between the altar and the balustrade that incloses it, where the minister is placed at the celebration of the commnnion.

CHANCEL, among us, is also the rector's freehold and part of his glebe, and therefore he is obliged to repair it; but where the rectory is impropriate, the impropriator must do it.

CHANCELLOR, an officer supposed originally to have been a notary or scribe under the emperors, and named *cancellarius*, because he sat behind a lattice, called, in Latin, *cancellus*, to avoid being crowded by the people.

Lord High CHANCELLOR *of Great Britain*, or *Lord Keeper of the Great Seal*, is the highest honour of the long robe, being made so *per traditionem magni sigilli, per dominum regem*, and by taking the oaths: he is the first person of the realm next after the king and princes of the blood, in all civil affairs; and is the chief administrator of justice next to the sovereign, being the judge of the court of chancery.

CHANCELLOR *of a Cathedral*, an officer that hears lessons and lectures read in the church, either by himself or his vicar; to correct and set right the reader when he reads amiss; to inspect schools; to hear causes; apply the seal; write and dispatch the letters of the chapter; keep the books; take care that there be frequent preachings, both in the church and out of it; and assign the office of preaching to whom he pleases.

CHANCELLOR *of a Diocese*, a lay officer under a bishop, who is judge of his court. See the article BISHOP'S-*Court*.

CHANCELLOR *of the Dutchy of Lancaster*, an officer appointed chiefly to determine controversies between the king and his tenants of the dutchy-land, and otherwise to direct all his majesty's affairs belonging to that court. See DUTCHY-*Court*.

CHANCELLOR *of the Exchequer*, an officer who presides in that court, and takes care of the interest of the crown.

CHANCELLOR *of the Order of the Garter, and other military Orders*, is an officer who seals the commissions and mandates of the chapter and assembly of the knights, keeps the register of their proceedings, and delivers acts thereof under the seal of their order.

CHANCELLOR *of an University*, is he who seals the diplomas, or letters of degrees, provision, &c. given in the university.

CHANCERY, the grand court of equity and conscience, instituted to moderate the rigour of the other courts that are bound to the strict letter of the law.

Apostolic CHANCERY, a court in the church of Rome, belonging to the pope.

CHANCRE, in surgery. See the articles SHANKER and ULCER.

CHANDELIER, in fortification, a kind of moveable parapet, consisting of a wooden frame, made of two upright stakes, about six feet high, with cross planks between them; serving to support fascines to cover the pioniers.

The chandeliers differ from blinds only in this, that the former cover the men only before, whereas the latter cover them also above.

They are used in approaches, galleries, and mines, to hinder the workmen from being driven from their stations.

CHANFRIN, in the manege, the fore-part of a horse's head, extending from under the ears along the interval between the eye-brows down to his nose.

CHANGES *of Quantities or Numbers, &c.* in arithmetic, the same with what commonly in books of arithmetic is treated under the word permutation. See the article PERMUTATION.

CHANNEL, in architecture, the soffit of a cornice, which makes the pendant mouchette of the larmer.

CHANNEL *of the Ionic Capital*, is that part which is under the abacus, and lies open upon the echinus or eggs, which has its centers or turning on every side to make the volutes or scrolls.

CHANNEL *of the Volute*, in the Ionic capital, the face of the circumvolution, inclosed by a listel.

CHANNEL, in geography, is a narrow passage which separates two continents, and is the communication between a gulf and a sea, or between two seas, or between a continent and an island. Such are the British channel, St. George's channel, &c.

CHANNEL *of a River*, the bed of a river. See the article RIVER.

CHANNEL, in hydrography, is the deepest part of a river, harbour, or streight, which is rendered most convenient for the tract of shipping.

CHANNEL,

CHANNEL, in naval architecture, a broad thick plank, placed edgeways on a ship's side, abreast of all the masts: they are used to extend the shroud by which the mast is secured to a proper width. See the article CHAINS.

CHANNEL *of the Mouth of a Horse*, that concavity in the middle of the lower jaw, appointed for a place to the tongue; which being bounded on each side by the bars, terminates in the grinders. It should should be large enough not to be pressed with the bit mouth.

CHANTLATES, in building, are pieces of boards nailed or fastened to the ends of the rafters, to support two or three rows of tiles, to make an eve to carry the rain water from the sides of the building.

CHANTOR, a singer in the choir of a cathedral. The word is almost grown obsolete, chorister or singing-man being commonly used instead of it.

CHANTOR is used by way of excellence for the præcentor or master of the choir, which is one of the first dignities of the chapter.

CHANTRY, or CHAUNTRY, a church or chapel endowed with lands, &c. for the maintenance of one or more priests to say mass for the souls of the donors. Hence,

CHANTRY-RENTS, are rents still paid to the crown by the purchasers of those lands.

CHAOS, that confusion in which matter lay when newly produced out of nothing at the beginning of the world, before God, by his Almighty word, had put it into the order and condition wherein it was after the six days creation.

CHAPE, among scabbard-makers, denotes the metalline plate fixed on the end of a scabbard, to prevent the point of the sword from piercing through it.

CHAPE, among sportsmen, signifies the tip of a fox's brush.

CHAPEAU, in heraldry, an ancient cap of dignity worn by dukes, being scarlet-coloured velvet on the outside, and lined with a fur.

It is frequently borne above an helmet instead of a wreath, under gentlemen's crests.

CHAPEL, or CHAPPEL, a place of divine worship, served by an incumbent under the denomination of a chaplain.

CHAPEL is also a name given to a printer's workhouse, in which sense they say, the laws of the chapel, the secrets of the chapel.

CHAPERON, a covering for the head, formerly worn both by men and women. Hence it became the name of those little shields, containing death's heads, and other funeral devices, placed upon the foreheads of horses that drew hearses at pompous funerals.

CHAPERON *of a Bit Mouth*, signifies the end of the bit that joins to the branch just by the banquet. In scatch mouths chaperon is round, in others it is oval.

CHAPITERS, in architecture, the crown, or upper part of a pillar. See CAPITAL.

CHAPLAIN, an ecclesiastic who officiates in a chapel.

CHAPLET, a string of beads used by the Roman catholics to count the number of their prayers. The invention of it is ascribed to Peter the hermit, who probably learned it of the Turks, as they owe it to the East-Indians.

CHAPLET, in architecture, a kind of baguette, or small ornament, cut, or carved into olives, beads, &c.

CHAPPE, in heraldry, the dividing an escutcheon by lines drawn from the center of the upper edge to the angles below, into three parts, the sections on the sides being of a different metal or colour from the rest.

CHAPTER, *Capitulum*, in ecclesiastical policy, a society or community of clergymen belonging to cathedrals and collegiate churches.

CHAPTER, in matters of literature, a division in a book for keeping the subject treated of more clear and distinct. St. Augustine compares them to inns, inasmuch as they refresh the reader, as these the traveller.

The three CHAPTERS, a famous phrase in ecclesiastical history, signifying a volume by Theodoret, an adherent of Nestorius, against St. Cyril.

CHAPTRELS, in architecture, the parts on which the feet of an arch stand, the same with impost. See IMPOST.

CHARACTER, *χαρακτηρ*, in a general sense, denotes any mark whatever, serving to represent either things ar ideas: thus, letters are characters, types, or marks of certain sounds, words, of ideas, &c. See the article LETTER, &c.

CHARACTERS *in Algebra*. The first letters of the alphabet, as *a*, *b*, *c*, *d*, &c. are generally the characters of the given quantities; and the last letters, as *x*, *y*, *z*, &c. the characters of the quantities sought. Some however use the consonants to represent the known, and the vowels to represent the unknown quantities.

m, *n*, *r*, *s*, *t*, &c. are the characters of indeterminate exponents, whether ratios or powers. Thus x^m, y^n, z^r, &c. imply undetermined powers of different kinds; mx, ny, rz, different multiples, or submultiples, of the quantities *x*, *y*, *z*, according as *m*, *n*, *r*, are either whole numbers or fractions.

\+ *plus*, or *more*, is the sign of real existence of the quantity it stands before, and is called an affirmative or positive sign. It is also the mark of addition: thus $a + b$, or $6 + 9$, implies that *a* is to be added to *b*, or 6 added to 9.

— *minus*, or *less*, before a single quantity, is the sign of negation or negative existence, shewing the quantity to which it is prefixed to be less than nothing. But between quantities it is the sign of subtraction; thus, $a - b$, or $8 - 4$, implies b subtracted from a, or 8 after 4 has been subtracted.

= *equal*. The sign of equality, though Des Cartes and some others use this mark ∞; thus, $a = b$ signifies that a is equal to b. Wolfius and some others use the mark = for the identity of ratios.

× *into*, or *with*. The sign of multiplication, shewing that the quantities on each side the same are to be multiplied by one another, as $a \times b$ is to be read a multiplied into b; 4×8, the product of 4 multiplied into 8. Wolfius and others make the sign of multiplication a dot between the two factors; thus, $5 . 4$ signifies the product of 5 and 4. In algebra the sign is commonly omitted, and the two quantities put together; thus, bd expresses the product of b and d. When one or both of the factors are compounded of several letters, they are distinguished by a line drawn over them; thus, the factum of $a + b - c$ into d, is wrote $d \times \overline{a + b - c}$. Leibnitz, Wolfius, and others, distinguish the compound factors, by including them in a parenthesis thus $(a + b - c) . d$.

÷ *by*. The sign of division; thus, $a \div b$ denotes the quantity a to be divided by b. In algebra the quotient is often expressed like a fraction, thus $\frac{a}{b}$ denotes the quotient of a divided by b. Wolfius makes the sign of division two dots; thus, $12 : 4$ denotes the quotient of 12 divided by $4 = 3$. If either the divisor or dividend, or both, be composed of several letters; for example, $a + b \div c$, instead of writing the quotient like a fraction, $\frac{a+b}{c}$, Wolfius includes the compound quantities in a parenthesis, thus $(a + b) : c$.

involution. The character of involution.

evolution. The character of evolution, or the extracting of roots.

> or ⊏ are signs of majority; thus, $a > b$ expresses that a is greater than b.

< or ⊐ are signs of minority; and when we would denote that a is less than b, we write $a < b$, or a⊐b.

∽ is the character of similitude used by Wolfius, Leibnitz, and others: it is used in other authors for the difference between two quantities, while it is unknown which is the greater of the two.

: : *so is*. The mark of geometrical proportion disjunct, and is usually placed between two pair of equal ratios, as $3 : 6 :: 4 : 8$, shews that 3 is to 6 as 4 is to 8.

∺ the mark of geometrical proportion continued, implies the ratio to be still carried on without interruption, as 2, 4, 8, 16, 32, 64 ∺ are in the same uninterrupted proportion.

√ *irrationality*. The character of a surd root, and shews, according to the index of the power that is set over it, or after it, that the square, cube, or other root is extracted, or to be extracted; thus, $\sqrt{16}$, or $\sqrt{^2 16}$ or $\sqrt{(2)\,16}$, is the square root of 16. $\sqrt[3]{25}$, the cube root of 25, &c.

This character sometimes affects several quantities, distinguished by a line drawn over them thus, $\sqrt{b + d}$ denotes the square root of the sum of b and d. When any term or terms of an equation are wanting, they are generally supplied by one or more asterisms: thus in the equation

$$\left.\begin{array}{l} y^2 + py + \frac{1}{4}p^2 + q \\ \quad - py - \frac{1}{2}p^2 \end{array}\right\} = 0,$$ the term $\pm py$ vanishing, is marked with an asterism, as $y^2 * - \frac{1}{4}p^2 + q$.

CHARACTERS *used in Astronomy*.

Characters of the planets.

♄ Saturn	☉ Sun	☽ Moon
♃ Jupiter	♀ Venus	⊕ Earth
♂ Mars	☿ Mercury	

Of the signs.

♈ Aries	♌ Leo	♐ Sagittarius
♉ Taurus	♍ Virgo	♑ Capricornus
♊ Gemini	♎ Libra	♒ Aquarius
♋ Cancer	♏ Scorpio	♓ Pisces

Of the aspects.

☌ or S Conjunction	△ Trine
SS Semisextile	Bq Biquintile
* Sextile	Vc Quincunx
Q Quintile	☍ Opposition
□ Quartile	☊ Dragon's head
Td Tredecile	☋ Dragon's tail

Of time.

A. M. *ante meridiem*, before the sun comes upon the meridian.

O. or N. noon.

P. M. *post meridiem*, when the sun is past the meridian.

Besides the above characters in astronomy, there are a few more which were used by the late royal professors of astronomy, Dr. Bradly, and Mr. Bliss, in their Astronomical Observations, the knowledge of which may be of some importance to those into whose hands the observations may fall, as they are expected in a little time to be made public.

The first is two dots placed after any observation, thus, :, which signifies that this observation is a little doubtful, and not to be depended upon. The second is four dots, passed after an observation: thus : :, which signifies that the observation is very dubious, and must not be made use of for determining any motion in the heavens. The third is E C, in observations of the moon's altitude on the meridian, which signifies that the moon's center was estimated, or its altitude taken as near as possible, both the upper and lower limb, at that time being invisible from its near proximity to the sun at the time of observation.

Lastly,

Laſtly, N, Q, G, which ſignifies clock, which ſtands near the tranſit quadrant and old obſervatory. When any two of theſe are found joined together with any quantity of time after them, thus, Q N 40″, ſignifies, that when the quadrant clock, and clock at the tranſit were compared together by a good ſtop-watch with a ſecond hand, that Q was faſter, or before that time forty ſeconds.

It may not be amiſs to remark here, that aſtronomers not only uſe the ſeven following characters, as has been ſhewn above, but likewiſe to expreſs the days of the weeks; ☉ Sunday, ☽ Monday, ♂ Tueſday, ☿ Wedneſday, ♃ Thurſday, ♀ Friday, ♄ Saturday.

CHARACTERS *in Geometry and Trigonometry.*

∥ The character of parallelism	⩵ equiangular, or ſimilar
△ triangle	⊥ equilateral
□ ſquare	∠ an angle
▯ □ rectangle	∟ right angle
⊙ circle.	⊥ perpendicular

° denotes a degree; thus 45° implies 45 degrees. ′ a minute; thus, 50′, is 50 minutes. ″, ‴, ⁗, denote ſeconds, thirds, and fourths: and the ſame characters are uſed where the progreſſions are by tens, as it is here by ſixties.

CHARACTERS *uſed in the Arithmetic of Infinites.*

A dot over a letter is the character of an infiniteſimal or fluxion; thus, $\dot{x}$, $\dot{y}$, &c. expreſs the fluxions or differentials of the variable x and y; and two, three, or more dots denote ſecond, third, or higher fluxions. Mr. Leibnitz, inſtead of a dot, prefixes the letter d to the variable quantity, in order to avoid the confuſion of dots in the differencing of differentials. See the articles FLUXIONS and DIFFERENTIAL *Calculus.*

CHARACTERS *in Grammar, Rhetoric, Poetry, &c.*

( ) parentheſis	F.R.S. fellow of the royal ſociety.
[ ] crotchet	SS. T. D. doctor in divinity
- hyphen	V.D.M. miniſter of the word of God
' apoſtrophe	LL.D. doctor of laws
´ emphaſis or accent	J.V.D. doctor of civil and canon law
˘ breve	M.D. doctor in phyſic
¨ dialyſis	A.M. maſter of arts
^ caret and circumflex	A.B. bachelor of arts
" quotation	
† ‡ and * references	
§ ſection or diviſion	
¶ paragraph	

For the other characters uſed in grammar, ſee the articles COMMA, COLON, SEMICOLON, &c.

CHARACTERS *among the ancient Lawyers, and in ancient Inſcriptions.*

§ paragraphs	C. code
ff digeſts	C.C. conſus
Scto ſenatus conſulto	T. titulus
E. extra	P.P.D.D. propria pecunia dedicavit
S.P.Q.R. ſenatus populuſque Romanus	D.D.M. dono dedit monumentum
P.P. pater patriæ	

CHARACTERS *in Medicine and Pharmacy.*

℞ recipe	M. manipulus, a handful
ā, āā, or ana, of each alike	P. a pugil
℔ a pound or a pint	P. Æ. equal quantities
℥ an ounce	S. A. according to art
ʒ a drachm	q. s. a ſufficient quantity
℈ a ſcruple	q. pl. as much as you pleaſe
gr. grains	P. P. pulvis patrum, the jeſuit's bark
ß or ſs, half of any thing	
cong. congius, a gallon	
coch. cochleare, a ſpoonful	

CHARACTERS uſed in muſic, and of muſical notes, with their proportions, are as follow.

▭ character of a large	8	𝅘𝅥𝅯 crochet	$\frac{1}{4}$
𝅗𝅥 a long	4	𝅘𝅥𝅮 quaver	$\frac{1}{8}$
𝅜 a breve		𝅘𝅥𝅯𝅘𝅥𝅯 ſemiquaver	$\frac{1}{16}$
𝅝 a ſemibreve	1	𝅘𝅥𝅰 demiſemiquaver	$\frac{1}{32}$
𝅗𝅥 minim	$\frac{1}{2}$		

♯ character of a ſharp note: this character at the beginning of a line, or ſpace, denotes that all the notes in that line are to be taken a ſemitone higher, than in the natural ſeries; and the ſame affects all the octaves above or below, though not marked: but when prefixed to any particulae note, it ſhews that note alone to be taken a ſemitone higher than it would be without ſuch character.

♭ or *b*, character of a flat note: this is the contrary to the other above, that is, a ſemitone lower.

♮ character of a natural note: when in a line or ſeries of artificial notes, marked at the beginning ♭ or ♯, the natural note happens to be required, it is denoted by this character.

𝄞 character of the treble cliff.

𝄡 character of the mean cliff.

𝄢: baſs cliff.

$\frac{2}{4}$, or $\frac{4}{4}$, characters of common duple time, ſignifying the meaſure of two crotchets to be equal to two notes, of which four make a ſemibreve.

𝄴 𝄵, characters that diſtinguiſh the movements of common time, the firſt implying ſlow, the ſecond quick, and the third very quick.

$\frac{3}{2}$, $\frac{3}{4}$, $\frac{3}{8}$, $\frac{3}{16}$, characters of ſimple triple time, the meaſure of which is equal to three ſemibreves, or to three minims.

$\frac{6}{4}$, or $\frac{6}{8}$, or $\frac{6}{16}$, characters of mixed triple time, where the meaſure is equal to ſix crochets or ſix quavers.

$\frac{9}{4}$, or $\frac{9}{8}$, or $\frac{9}{16}$, or $\frac{9}{32}$, or $\frac{9}{64}$, characters of compound triple time.

$\frac{12}{12}$, $\frac{12}{32}$, $\frac{12}{16}$, or $\frac{12}{8}$, or $\frac{12}{4}$, characters of that ſpecies of triple time called the meaſure of twelve times. See TRIPLE.

Numeral CHARACTERS, uſed to expreſs numbers, are either letters or figures.

The Arabic character, called alſo the common

one,

one, becauſe it is uſed almoſt throughout Europe in all ſorts of calculations, conſiſts of theſe ten digits, 1, 2, 3, 4, 5, 6, 7, 8, 9, 0.

The Roman numeral character conſiſts of ſeven majuſcule letters of the Roman alphabet, viz. I, V, X, L, C, D, M.

The I denotes one, V five, X ten, L fifty, C a hundred, D five hundred, and M a thouſand.

The I repeated twice makes two, II; thrice, three, III; four is expreſſed thus IV, as I before V or X takes an unit from the number expreſſed by theſe letters. To expreſs ſix an I added to a V, VI; for ſeven, two, VII: and for eight, three, VIII: nine is expreſſed by an I before X, thus IX.

The ſame remark may be made of the X before L or C, except that the diminution is by tens; thus, XL denotes forty, XC, ninety, and LX ſixty. The C before D or M diminiſhes each by a hundred.

The number five hundred is ſometimes expreſſed by an I before a C inverted, thus, IↃ; and inſtead of M, which ſignifies a thouſand, an I is ſometimes uſed between two C's, the one direct, and the other inverted, thus CIↃ. The addition of C and Ↄ before or after, raiſes CIↃ by tens, thus CCCIↃↃ expreſſes ten thouſand, CCCCIↃↃↃ, a hundred thouſand.

The Romans alſo expreſſed any number of thouſands by a line drawn over any numeral leſs than a thouſand; thus, $\overline{V}$ denotes five thouſand, $\overline{LX}$ ſixty thouſand: ſo likewiſe $\overline{M}$ is one million, $\overline{MM}$ is two millions, &c.

CHARACTER, in epic and dramatic poetry, that which is peculiar in the manners of any perſon, and diſtinguiſhes him from all others.

CHARACTERISTIC, in a general ſenſe, a peculiar mark or character whereby a perſon or thing is diſtinguiſhed from all others.

CHARACTERISTIC *of a Logarithm*, the ſame with its index or exponent.

CHARACTERISTIC *Triangle of a Curve*, in the higher geometry, is a rectilinear right-angled triangle, whoſe hypothenuſe makes part of the curve, not ſenſibly different from a right line.

It is ſo called, becauſe curve lines are uſed to be diſtinguiſhed hereby.

Suppoſe, for example, the ſemiordinate, $p\,m$, (Plate XXXIII. *fig.* 2.) infinitely near another PM, then will $P\,p$ be the differential of the abſciſſe; and letting fall a perpendicular $M\,R = P\,p$, R M will be the differential of the ſemiordinate: draw therefore a tangent T M, and the infinitely ſmall arch M *m* will not differ from a right line. Conſequently M *m* K is a rectilinear right-angled triangle, and conſtitutes the characteriſtic triangle of that curve.

CHARAG, the tribute which the Chriſtians and Jews pay to the Grand Signior.

CHARBON, in the manege, that little black ſpot or mark which remains after a large ſpot in the cavity of the corner teeth of a horſe: about the ſeventh or eighth year, when the cavity fills up, the tooth being ſmooth and equal, it is ſaid to be raiſed.

CHARCOAL, a ſort of fuel conſiſting of wood chared or half burnt.

There are conſiderable differences in the coals of different vegetables, in regard to their habitude to fire: the very light coals of linen, cotton, ſome fungi, &c. readily catch fire from a ſpark, and ſoon burn out; the more denſe ones of woods and roots are ſet on fire more difficultly, and burn more ſlowly: the coals of the blackberry-bearing alder, of the hazel, the willow, and the lime-tree, are ſaid to anſwer beſt for the making of gunpowder and other pyrotechnical compoſitions, perhaps from their being eaſily inflammable: for the reduction of metallic calces thoſe of the heavier woods, as the oak and the beech, are preferable, theſe ſeeming to contain a larger proportion of the phlogiſtic principle, and tha', perhaps, in a more fixed ſtate; conſidered as common fuel, thoſe of the heavy woods give the greateſt heat, and require the moſt plentiful ſupply of air to keep them burning; thoſe of the light woods preſerve a glowing heat, without much draught of air, till the coals themſelves are conſumed; the bark commonly crackles and flies about in burning, which the coal of the wood itſelf very ſeldom does.

Charcoal, in burning, is ſuppoſed to emit a peculiar vapour, which confined, and accumulated in a cloſe room, proves poiſonous to animals: there are, indeed, too many examples of fatal conſequences from the burning of charcoal in cloſe places; not, however, from the charcoal giving out any pernicious matter, but from the quality of the air of the room being altered by the fire: air that has paſſed through burning fuel is no longer capable of ſupporting either fire or the life of animals.

CHARGE, in artillery, the quantity of powder, ſhot, bombs, grenadoes, with which a cannon or mortar is loaded for execution. See the article CARTRIDGE.

Cannon are charged by putting down into the bottom of the bore, firſt a quantity of powder, one third, or one half the weight of the ball. This is done with an inſtrument *a*, Plate XXXIII. *fig. a.* called a ladle, which is a ſort of ſpoon, generally made of copper, fixed to the end of a ſtaff *d*, which is called its handle. Upon the powder is put in a wad of hay, preſſed or beat down very well with the inſtrument *e*, called a rammer. Upon this hay is put the ball, to ſecure it in its place, another wad is well rammed down upon it: the touch-hole of the piece is then filled with powder, from the upper part of which a little train is laid that communicates with it. The uſe of this train is to prevent the exploſion

Fig. 1. Plain Chart

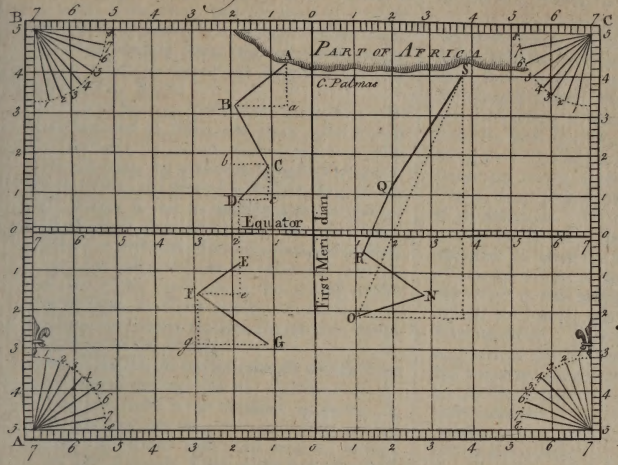


Fig. 3. Centrepetal Force

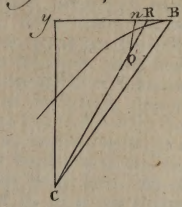
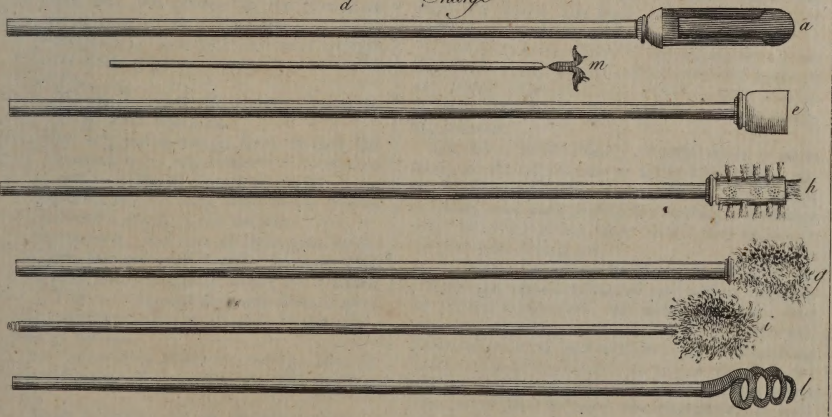


Fig. 2. Character of a Curve

Charge



Pent

Sight Peice

Priming Iron

of the powder that fills the touch-hole from operating directly upon the inſtrument uſed to fire the piece, which in this caſe might be forced out of the hand of the gunner; an inconvenience which is prevented by ſetting fire to the end of the train.

In the modern pieces, a little gutter or channel is made, about a line deep, and ſix wide, to prevent the wind from diſperſing or blowing away the train. This channel reaches from the touch-hole to the ſhield, on which is carved the king's arms. See Plate XXXVII. *fig.* 1.

The cannon being pointed at the place which the bullet is intended to ſtrike, the train is fired, and the fire immediately communicated to the powder in the touch-hole, by which it is further communicated to that in the piece; and this powder being kindled, dilates ſo as to occupy a much greater quantity of ſpace than when in grains; and being thus dilated, it make an effort on every ſide to force itſelf out: the bullet making leſs reſiſtance than the ſides of the piece, upon which the powder preſſes at the ſame time, is driven out by its whole force, and acquires that violent motion, the effect of which is well known to the world.

In Plate XXXIII. all the inſtruments neceſſary for charging cannon are repreſented. Beſides thoſe already deſcribed, there is the maulkin, or ſpunge, *b*, which is uſed to clean the piece after firing, and to extinguiſh any ſparks that may remain behind. This is a ſort of bruſh, fixed to the end of a ſtaff. To ſpunge a piece is to put in this inſtrument, and with it clean well the cavity, at the ſame time ſtopping the aperture of the touch-hole.

The figures *g*, *b*, *i*, repreſent maulkins or ſpunges of a different kind, made of ſheep-ſkins, fixed to a proper handle.

The wad-hook *l*, called alſo a worm, ſerves to draw the charge when neceſſary.

The picker or priming-iron *g*, ſerves to clear the inſide of the touch-hole, and render it fit to receive the prime, and is a kind of large iron needle.

The lint-ſtock *m*, is a long ſtaff, to the end of which is faſtened a match to fire the piece.

The chapiteau *n*, is a ſort of little pent-houſe, made by two thin pieces of board, joined together at top, ſo as to form an angle of about one hundred degrees. This is ſet up over the touch-hole, to prevent the prime from being carried away by the wind, or wetted by the rain.

All the inſtruments above-mentioned, uſed in charging and managing a cannon, are called cannon furniture.

To charge a mortar (as in charging cannon) many inſtruments are neceſſary.

The principal are, a rammer of the ſame diameter as the piece, to ram in and beat down the wadding and turf which cover the powder; an iron ſcraper, to clean the bore and chamber of the mortar, and a little ſpoon to clean more particularly the powder chamber; a wooden kniſe, of about a foot long, to force the earth cloſe in round the ſides of the bomb; there is need alſo of priming-irons, aiming wedges, and two lint-ſtocks.

The officer who directs the charging of the mortar, having aſcertained the proper quantity of powder, cauſes it to be put into the chamber of the mortar, and then to be covered with a wad, well beat down with the rammer. Over theſe are put two or three ſhovel-fulls of earth, which are alſo well beat or rammed down; after which the bomb is placed upon this earth, as near the middle of the mortar as poſſible, with the fuſe, or touch-hole, uppermoſt; more earth is then put in, and preſſed down cloſe all round the bomb, with the wooden kniſe juſt mentioned, ſo as to keep the bomb firm in the ſituation it is placed in. All this being done, the officer points the mortar, that is, gives the inclination neceſſary to carry the bomb to the place deſigned. When the mortar is thus fixed, the fuſe is opened, the picker is alſo paſſed into the touch-hole of the mortar to clear it, and it is then primed with the fineſt powder. This done, two ſoldiers, taking each one of the lint-ſtocks, the firſt lights the fuſe, and the other fires the mortar. The bomb, thrown out by the exploſion of the powder, is carried to the place intended, and the fuſe, which ought to be exhauſted at the moment of the bomb's falling, ſets fire to the powder it is charged with; this, immediately, by its exploſion, burſts the bomb into ſplinters, which are thrown off circularly round the point the bomb falls upon, and do conſiderable damage on every ſide.

CHARGE, in heraldry, is applied to the figures repreſented on the eſcutcheon, by which the bearings are diſtinguiſhed from one another: and it is to be obſerved, that too many charges are not ſo honourable as fewer.

CHARGE, in the manege, a preparation, or ointment, of the conſiſtence of a thick decoction, applied to ſhoulder-ſplaits, inflammations, and ſprains of horſes: the parts affected are rubbed, and chaffed with this compoſition, after which they ſhould be covered with ſinking paper.

CHARGE, or OVERCHARGE, in painting, an exaggerated repreſentation of any perſon, wherein the likeneſs is preſerved, but withal ridiculed: few painters have the genius to ſucceed in theſe charges. The method is, to pick out and heighten ſomething amiſs in the face, whether by way of defect or redundancy; thus, if nature has given a man a noſe a little larger than ordinary, the painter falls in with her, and makes the noſe extravagantly long; and ſo in other caſes.

CHARGE *of Lead* denotes a quantity of thirty-ſix pigs.

CHARGED, in heraldry, a ſhield carrying ſome impreſs or figure is ſaid to be charged therewith; ſo alſo when one bearing, or charge, has ano-

ther figure added upon it, it is properly ſaid to be charged.

CHARGING, in military affairs, an aſſault made by an army, or any party of men on the enemy. See ATTACK.

CHARIOT, a half coach, having only a ſeat behind, with a ſtool at moſt before.

Triumphal CHARIOT was one of the principal ornaments of the Roman celebration of a victory. See TRIUMPH.

CHARISIA, in heathen antiquity, a nocturnal feſtival, kept in honour of the graces, and conſiſting chiefly of dancing; only that ſweet-meats, called likewiſe chariſia, were diſtributed among thoſe preſent.

CHARITY, among divines, one of the three grand theological virtues, conſiſting in the love of God, and of our neighbour; or the habit and diſpoſition of loving God with all our heart, and our neighbour as ourſelves.

CHARITY, among moraliſts, is uſed for the effect of a moral virtue; and conſiſts in ſupplying the neceſſities of others, whether with money, council, aſſiſtance, or the like.

CHARLES's-WAIN, in aſtronomy, ſeven ſtars ſo ſituated in the conſtellation Urſa Major, that they ſomething, or by ſome have been ſuppoſed to, repreſent the figure of a wain.

CHARLOCK, the Engliſh name of a plant called by botaniſts, ſinapis. See the article SINAPIS.

Charlock is a very troubleſome weed in corn-fields, where we find two ſpecies of it very common, viz. one with a yellow flower, and the other with a white one. To prevent its growth the farmers mix horſe dung with their cow dung uſed in manure, as the laſt is very apt to breed the charlock. When a field of barley is much infeſted with it, they mow it down in May, when in flower, taking care only to cut it ſo low as juſt to take off the tops of the leaves of the barley.

CHARM, a term derived from the Latin, *carmen*, a verſe, and uſed to denote a magic power, or ſpell, by which, with the aſſiſtance of the devil, ſorcerer, and witches, were ſuppoſed to do wonderful things, far ſurpaſſing the power of nature. Theſe things are now ſufficiently exploded.

CHARNEL, or CHARNEL HOUSE, a kind of portico, or gallery, uſually in or near a church-yard, over which were anciently laid the bones of the dead, after the fleſh was wholly conſumed.

CHARRE, or GILT-CHARRE, a truttaceous fiſh, called by many carpio, and reckoned by Artedi a ſpecies of ſalmon, leſs than a foot in length, with five rows of teeth in its palate.

Red CHARGE is likewiſe a ſpecies of ſalmon, called by authors umbla minor: it is much of the ſame ſize with the former, with the belly-fin red, and the under-jaw a little longer than the upper-one.

CHART, or SEA-CHART, is a hydrographical map, or a projection of ſome part of the earth's ſuperficies in plane, for the uſe of navigators.

Charts differ very conſiderably from geographical or land maps, which are of little or no uſe in navigation: nor are ſea-charts all of the ſame kind, being conſtructed on very different principles; and are chiefly diſtinguiſhed by the following names; plane-chart, mercator's-chart, and globular-chart.

Plane-CHARTS are ſuch wherein the circles of latitude and longitude are laid down parallel, and every where of equal diſtance. Theſe are very incorrect, and ought not to be put in uſe, unleſs they only repreſent a ſmall piece, and that near the line; becauſe they give the ſame extent or number of miles to a degree in thoſe parallels near the pole, as thoſe near the equator, which is ſo well known to every ſailor to be erroneous, that there will be no occaſion here to expatiate upon it.

To conſtruct a plane chart, that ſhall contain from five degrees north latitude, to five degrees ſouth latitude, and from ſeven degrees eaſt, to ſeven weſt longitude; draw the meridian A B, (Plate XXXIII. *fig.* 3.) at pleaſure, with a pencil; then from the point A, ſet off ten equal parts (taken from any convenient ſcale) towards the point B; which ten parts will be equal to the ten degrees of latitude, and will determine the point B. At right angles to the meridian A B, draw the lines A D and B C, which will repreſent the parallels of five degrees ſouth latitude, and five degrees north latitude; and from A and B, in each line A D and B C, ſet off a quantity of equal parts, (taken from the ſame ſcale from which your degrees of latitude were taken) equal to the number of degrees in longitude your chart is to contain, and you will then determine the point C and D, which join by drawing the line C D. Through the ſeveral degrees, or equal parts before ſet off in the line A B, draw as many lines parallel to B C and A D: likewiſe through each diviſion, in the line B C and A D, draw lines parallel to A B and C D, which will repreſent ſo many parallels of longitude, and ſo many meridians.

If you divide the right angles A, B, C, D, into eight equal parts, and draw lines from the angular points thereof through the ſeveral diviſions of the arches, they will repreſent the rhomb lines upon the chart, which are of uſe in finding the bearings of places from each other. But to avoid the confuſion which attends ſuch a multiplicity of lines, we have here only extended them to the diviſions in each quadrant, which will be found equally uſeful in finding the bearings of different places: for by laying a parallel-ruler on the two given places, and extending the other part to two of the quadrants, you will eaſily diſcover to which of the lines the ruler is parallel, which will be the bearing of the two places required. For the uſe of this chart, ſee *Plane* SAILING.

Reduced

Reduced CHART, or *Chart of Reduction*, is that wherein the meridians are represented by right lines, parallel to one another, but unequal; these therefore, it appears by construction, must correct the errors of the plane charts. But since the parallels should cut one another at right angles, these charts are defective, inasmuch as they exhibit the parallels inclined to the meridians.

Hence another kind of reduced charts has been invented, wherein the meridians are parallel; but the degrees thereof unequal. These are called Mercator's charts.

Mercator's CHART is that wherein the meridians and parallels are represented by parallel right lines; but the degrees of the meridian are unequal, still increasing as they approach the pole, in the same proportion as those of the parallels decrease; by means whereof the same proportion is preserved between them as on the globe.

This chart has its name from the author, who first proposed it for use, and made the first chart of this projection, N. Mercator: but the thought was not originally his own, as having been hinted at by Ptolemy near two thousand years before: nor is the perfection owing to him; our countryman, Mr. Wright, being the first who demonstrated it, and shewed a ready way of constructing it, by enlarging the meridian line by the continual addition of secants. For the construction and use of Mercator's chart, see *Mercator's* SAILING.

Globular CHART, a meridional projection, wherein the distance of the eye, from the plane of the meridian, upon which the projection is made, is supposed to be equal to the sine of the angle of 45°. This projection comes the nearest of all to the nature of the globe, because the meridians therein are placed at equal distances; the parallels also are nearly equidistant, and consequently the several parts of the earth have their proper proportion of magnitude, distance, and situation, nearly the same as on the globe itself.

Chorographic CHARTS, descriptions of particular countries. See CHOROGRAPHY.

Heliographic CHARTS, descriptions of the body of the sun, and of the maculæ, or spots, observed on it. See HELIOGRAPHY.

Hydrographic CHARTS, sheets of large paper, whereon several parts of the land and sea are described, with their respective coasts, harbours, sounds, flats, rocks, shelves, sands, &c. together with the longitude and latitude of each place, and the points of the compass. See the article MERCATOR's *Chart*.

Selenographic CHARTS, particular descriptions of the spots, appearances, and maculæ of the moon. See the article SELENOGRAPHY.

Topographic CHARTS, draughts of some small parts of the earth only, or of some particular places, without regard to its relative situation, as London, York, &c.

CHARTER, in law, a written instrument or evidence of things acted between one person and another.

Great CHARTER, MAGNA-CHARTA. See the article MAGNA-CHARTA.

CHARTER *of the King* is where the king makes a grant to any person or body politic, as a charter of exemption, of privilege, pardon, &c.

CHARTER-LAND, such land as a person holds by charter; that is, by evidence in writing, otherwise termed freehold. See the article FREEHOLD.

CHARTY-PARTY, in commerce, a deed or writing indented; that is, made between merchants and sea-faring men, concerning their merchandise and maritime affairs.

A charter-party of affreightment, settles the agreement in relation to the freight of a ship and cargo, between the merchant and commander or master of the vessel. It binds the master to deliver the cargo in good condition at the place of discharge, &c.

In those charter-parties, if the dangers of the sea are excepted, it has been adjudged that such exception extends as well to any danger upon the sea from pirates or men of war, as to common dangers by shipwreck, tempest, &c.

CHARTIS REDDENDIS, in law, a writ that lies against a person, who having charters of feoffment delivered to him to keep, afterwards refuses to deliver them.

CHARYBDIS, a rock in the streight of Messina, between Italy and Sicily, much celebrated in the writings of ancient poets.

CHASE, a great quantity of ground lying open and privileged for wild beasts and wild fowl. Such is Enfield-chase.

A chase differs from a forest, inasmuch as it may be in the hands of a subject, which a forest in its proper nature cannot; and from a park, in that it is not inclosed, and hath more officers.

CHASING *of Gold, Silver, &c.* See the article ENCHASING.

CHASTE-TREE, in botany. See the articles AGNUS CASTUS and VITEX.

CHASTISEMENT, in the manege, the severe and rigorous effect of the aids; for when the aids are given with severity, they become punishments. See the article AIDS.

CHECK, or CHECK-ROLL, a roll or book, wherein is contained the names of such persons as are attendant and in pay to the king, or other great personages, as the houshold servants.

Clerk of the CHECK, in the king's houshold, has the check and controulment of the yeomen of the guard, and all the ushers belonging to the royal family, allowing their absence or defects in attendance, or diminishing their wages for the same, &c. He also, by himself or deputy, takes the view of those

thoſe that are to watch in the court, and has the ſetting of the watch, &c.

Clerk of the CHECK, in the king's navy, is alſo the name of an officer inveſted with the like power at the ſeveral dock-yards.

CHECKY, in heraldry, is when the ſhield, or a part thereof, as a bordure, &c. is chequered, or divided into chequers or ſquares, in the manner of a cheſs-board.

This is one of the moſt noble and ancient figures uſed in armory; and a certain author ſays, that it ought to be given to none but great warriors, in token of their bravery; for the cheſs-board repreſents a field of battle, and the pawns of men, placed on both ſides, repreſent the ſoldiers of the two armies, which move, attack, advance, or retire, according to the will of the two gameſters, who are the generals.

This figure is always compoſed of metal and colour: but ſome authors would have it reckoned among the ſeveral ſorts of furs.

CHEEK, in anatomy, that part of the face ſituated below the eyes, on each ſide. Wounds of the cheeks, if ſmall, may be cured by the dry ſuture; but if large, the bloody one muſt be uſed. See the article SUTURE.

CHEEKS, among mechanics, are almoſt all thoſe pieces of their machines and inſtruments, that are double, and perfectly alike; as the cheeks of a mortar, which are made of ſtrong wooden planks, of a ſemi-circular form, bound with thick plates of iron, and fixed to the bed with four bolts: theſe cheeks riſe on each ſide the mortar, and ſerve to keep it at what elevation is given it: the cheeks of a printing-preſs are its two principal pieces, placed perpendicular and parallel to each other, and ſerving to ſuſtain the three ſommers, &c.

CHEEKS *of the Maſt*, in naval affairs, certain projecting parts ſituated on the upper-end of the maſt for ſuſtaining the weight of the top-maſt which reſt upon them below, and is kept ſteady above by the cap. See CAP and TRUSSEL-TREES.

CHEESE, *Caſeus*, a ſort of food, prepared of curdled milk, purged from the ſerum of whey, and afterwards dried for uſe.

There is likewiſe a kind of medicated cheeſe, made, by intimately mixing the expreſſed juice of certain herbs, as ſage, baum, mint, &c. with the churd, before it is faſhioned into a cheeſe.

CHEESE-RUNNET, in botany, the ſame with the gallium of authors. See the article GALLIUM.

CHEESLIP-BAG, that in which houſewives prepare and keep their runnet for making cheeſe. See RUNNET.

CHEIRANTHUS, in botany, a genus of plants whoſe flower conſiſts of four cruciform petals, with ſix ſubulated parallel ſtamina. The fruit is a long compreſſed bilocular pod, opening with two valves, and filled with compreſſed ſeeds. This genus of plants comprehends the wall-flower, ſtock-gilliflower, and dames violet. See the articles WALL-FLOWER, STOCK, &c.

CHELIDONIUM. See the article CELANDINE.

CHELONE, in botany, a genus of plants producing ringent monopetalous flowers. The tube of the corolla is cylindric, and very ſhort; the mouth is inflated, oblong, convex above, and plane below; the upper lip is obtuſe, and emarginated; the lower is almoſt equal with the higher, lightly cut in three ſegments. The fruit is an ovate bilocular capſule, and contains many flat roundiſh ſeeds, covered with a membranaceous margin.

Botaniſts enumerate three ſpecies of this genus, which are all natives of North America.

CHEMA, or CHEME, in antiquity, a meaſure, among the ancient phyſicians, containing two ſpoonfuls: it was the fifth part of the cyathus or cup: full of oil, it weighed two drams, and ſeventeen grains.

CHEMIN DES RONLES, in fortification, a ſpace between the rampart and low parapet under it, for the rounds to go about the ſame.

CHEMISE, in fortification, the wall with which a baſtion, or any other bulwark of earth, is lined for its greater ſupport and ſtrength: or it is the ſolidity of the wall from the talus to the ſtone-row.

Fire CHEMISE, a piece of linen-cloth, ſteeped in a compoſition of oil of petrol, camphor, and other combuſtible matters, uſed at ſea, to ſet fire to an enemy's veſſel.

CHEMICAL *Laboratory*, or *Elaboratory*, the place where chemical proceſſes are performed.

CHEMISTRY, χημια, is an art that teaches us how to perform certain phyſical operations, by which bodies that are diſcernible by the ſenſes, or that may be rendered ſo, and that are capable of being contained in veſſels, may, by ſuitable inſtruments, be ſo changed, that particular determined effects may be thence produced, and the cauſes of theſe effects underſtood by the effects themſelves, to the manifold improvement of various arts.

CHENOPODIUM, in botany, a genus of plants whoſe flower is apetalous, and contains a premanent concave pentaphyllous calix, with five ſubulated filaments, topped with roundiſh double antheræ. The cup ſupplies the place of a pericarpium, and contains an orbicular depreſſed ſeed. There are ſeveral ſpecies in this genus, one of which is called Botrys or Jeruſalem oak. This plant grows naturally in many parts of America: it has a ſmall white root, from which ariſes ſeveral ſtalks: theſe are round, ſtiff, erect, hairy, and furniſhed with many leaves of a light green, and ſomewhat like thoſe of the oak: the flowers come out from the wings of the leaves, on the upper part of the branches, in looſe ſpikes; theſe appear in July, and the ſeeds ripen in September. The whole plant has a ſtrong but not diſagreeable

ble ſmell, and the taſte is ſubacrid, aromatic, and reſinous.

This plant is propagated by ſowing its ſeeds when ripe, which is in autumn. It is reckoned to be good againſt cholics that proceed from wind; but in the preſent medical practice is not much uſed.

CHEQ, or CHERIF, the prince of Mecca, who is, as it were, high-prieſt of the law, and ſovereign pontiff of all the Mahometans, of whatſoever ſect or country they be. See CALIPH.

CHEREM, the Jewiſh antiquity, the ſecond and greater ſort of excommunication among the Jews.

CHERLERIA, in botany, a genus of decandrious plants, whoſe flower is apetalous; but contains five very ſmall, roundiſh, emarginated nectariums, placed in a circular direction, with ten ſubulated filaments, topped with ſimple antheræ. The fruit is an ovated, trilocular capſule with three valves, containing two remform ſeeds.

CHERRY-TREE, *Ceraſus*, in botany, the name of a well known genus of trees, the flower of which is roſaceous, or compoſed of five roundiſh concave petals, arranged in a circular form. When the flower is decayed, the germen becomes a roundiſh or heart-ſhaped fleſhy fruit, containing a roundiſh ſtone.

This genus is claſſed with the prunus or plumb, by Linnæus, but as they differ ſo much in the fruit, and are generally underſtood to be a diſtinct genera, it was therefore in this work thought neceſſary to keep them ſeparate.

The cherry-tree, it is ſaid, is a native of Pontus, a province of Aſia Minor, from whence it was brought into Italy by Lucullus, the Roman, Anno Rom. 680; and about one hundred years after was introduced into England, where there are various ſorts cultivated at preſent, ſuch as the Flemiſh-cherry, Kentiſh-cherry, May-duke, arch-duke, red-heart, white-heart, black-heart, amber-heart, ox-heart, bleeding heart, carnation, morello, and ſome others.

The ſeveral ſorts of cherries are propagated by budding or grafting the different kinds into ſtocks of the black or wild red cherries, they being ſuppoſed to be of longer duration than the garden ſorts.

Cherry-trees are raiſed in great quantities in the nurſery gardens, both ſtandards and dwarfs: the ſtandards for planting orchards, particularly in Kent, where there are large plantations. The uſual diſtance allowed for their ſtanding is about forty feet each way. Theſe ſtandard trees ſhould be planted in a ſituation defended as much as poſſible from the eaſt and weſtern winds; the one being likely to deſtroy their bloſſoms in the ſpring, and the other by its violence is very apt to break their tender branches: this occaſions their guming, and is very prejudicial to them. The ſorts beſt approved of for an orchard are the Kentiſh, flemiſh, duke, and common red cherry.

Cherry-trees may alſo be planted againſt walls in any expoſure: the May-duke being generally planted againſt a ſouth aſpected wall, though it is not amiſs to have ſome againſt a north wall, which will continue their ſeaſon the longer; and the ſame may be done with the other ſorts. The morello cherry is generally planted againſt walls fronting the north. This fruit is commonly uſed in preſerving: yet where they are planted to a better aſpect, and ſuffered to hang on the trees till they are thoroughly ripe, they are not a bad fruit for the table; for by long hanging it looſes moſt of its acidity or ſowerneſs.

The leſs cherries are pruned, the better they like it; but, however, where weak or luxuriant branches happen, they muſt be governed by the knife. When cherry-trees take to bearing very early, and grow but little, it is beſt to pull off moſt of the bloom, and ſhorten the branches, which will cauſe the tree to ſhoot with freſh vigour.

The black-cherry is ſuppoſed to be a native of England, it being frequently found in the woods, it grows large; and the timber is uſed by turners and other artificers in wood. From this ſort the black-coroon-cherry is ſuppoſed to have been produced.

Cherry-trees thrive beſt in a dry hazely loam. In a gravelly ſoil they are very ſubject to blights, and ſeldom ſtand long good.

The Kentiſh-cherries are a very wholeſome fruit, and grateful to the ſtomach; but the black only are uſed in medicine: they are preſcribed in all diſeaſes of the head and nerves; and by ſome are alſo accounted diuretic, eſpecially the water diſtilled from them.

CHERRY *with double flowers*, a ſpecies of the former. It is propagated for the beauty of its flowers, which are extremely fine. Theſe are produced in large bunches, which makes it one of the moſt beautiful which come out in the ſpring.

CHERRY-BARBADOES. See MALPIGHIA.

CHERRY-CORNELIAN. See CORNUS.

CHERRY-WINTER. See ALKENENGI.

CHERT, among miners, denotes a kind of flinty ſtone, found in thin ſtrata in quarries of lime-ſtone.

CHERUB, or CHERUBIN, a celeſtial ſpirit, which in the hierarchy is placed next to the ſeraphim. See HIERARCHY.

CHESNUT-TREE, the Engliſh name of the caſtanea of botaniſts. See the article CASTANEA.

CHEST, in commerce, a kind of meaſure, containing an uncertain quantity of ſeveral commodities.

A cheſt of ſugar, v. g. contains from ten to fifteen hundred weight; a cheſt of glaſs, from two hundred to three hundred feet; of Caſtile-ſoap, from two and an half to three hundred weight; of indigo, from one and an half to two hundred weight, five ſcore and twelve pounds to the hundred.

CHEST, in anatomy, the breaſt, or that part of the body which contains the heart and lungs. See the article BREAST.

CHESSTREE, in naval affairs, a piece of wood which ſtands up and down edgeways, bolted to the ſhips ſide: there is a large hole in it, through which the rope, called the tack, is paſſed, which is faſtened to the clue or lower corner of the main-ſail; and when the clue of the ſail comes down to the cheſs-tree, the tack is ſaid to be aboard. *Shipwreck, p. 51. in the Notes.*

CHEVAGE, or CHIEFAGE, a tribute of a certain ſum of money, formerly paid by ſuch as held lands in villinage to their lords, by way of acknowledgement, being a kind of poll, or head-money.

CLEVALER, in the manege, is ſaid of a horſe when in paſſaging upon a walk or trot, his off fore-leg croſſes or overlaps the near fore-leg every ſecond motion.

CHEVALIER, in a general ſenſe, ſignifies a knight, or horſeman: but

CHEVALIER, in heraldry, ſignifies any cavalier, or horſeman, armed at all points, by the Romans called cetaphractus eques; now out of uſe, and only to be ſeen in coat-armour.

CHEVAUX DE FRISE, in fortification, a large joiſt or piece of timber, about a foot in diameter, and ten or twelve in length; into the ſides whereof are diven a great number of wooden pins, about ſix feet long, armed with iron points, and croſſing one another.

The chief uſe of the chevaux de friſe, is to ſtop up breaches, or to ſecure the avenues of a camp, from the inroads both of horſe and foot. It is ſometimes alſo mounted on wheels, with artificial fires, to roll down in an aſſault.

CHEVRETTE, in the art of war, an engine for raiſing of guns or mortars into their carriages.

It is made of two pieces of wood, about four feet long, ſtanding upright upon a third ſquare piece: the upright pieces are about a foot aſunder, and pierced with holes exactly oppoſite to each other, having an iron bolt, which being put through theſe holes higher or lower, at pleaſure, ſerves with a hand-ſpike, which takes its poiſe over this bolt, to raiſe any thing by force.

CHEVRON, or CHEVERON, in heraldry, one of the honourable ordinaries of a ſhield, repreſenting two rafters of an houſe, joined together as they ought to ſtand: it was anciently the form of the prieſteſſes head attire: ſome ſay it is a ſymbol of protection; others, of conſtancy; others, that it repreſents knights ſpears, &c.

Per CHEVRON, in heraldry, is when the field is divided only by two ſingle lines, riſing from the two baſe points, and meeting in the point above, as the chevron does.

CHEVRONED, is when the coat is filled with an equal number of chevrons, of colour and metal.

CHEVRONEL, a diminutive of chevron, and as ſuch only containing half a chevron.

CHEVRONNE, or CHEVRONNY, ſignifies the dividing of the ſhield ſeveral times chevron-wiſe.

CHIAOUS, a word in the original Turkiſh, ſignifying envoys, are officers to the number of five or ſix hundred in the grand ſignior's court, under the command of a chiaous baſchi. They frequently meet in the grand vizier's palace, that they may be in readineſs to execute his orders, and carry his diſpatches into all the provinces of the empire. The chiaous baſchi aſſiſts at the divan, and introduces thoſe who have buſineſs there.

CHIARO-SCURO, among painters. See the article CLARO-OBSCURO.

CHIAUSI, in the Turkiſh affairs, officers otherwiſe called mutes, employed in executing perſons of diſtinction; the orders for doing of which are ſent them by the grand ſignior, wrapped up in a black cloth.

CHICANE, or CHICANRY, in law, an abuſe of judiciary proceeding, tending to delay the cauſe, to puzzle the judge, or impoſe upon the parties.

CHICANE, in the ſchools, is applied to vain ſophiſms, diſtinctions, and ſubtleties, which protract diſputes and obſcure the truth.

CHICHES, or CHICH-PEASE, the ſame with the cicer of botaniſts. See CICER.

CHICK-WEED, *Aſine*, in botany. See the article ALSINE.

CHIEF, a term ſignifying the head or principal part of a thing or perſon. Thus we ſay, the chief of a family, &c.

CHIEF, in heraldry, is that which takes up all the upper-part of the eſcutcheon from ſide to ſide, and repreſents a man's head.

In CHIEF, imports ſomething borne in the chief part or top of the eſcutcheon.

CHIEF-LORD, the feudal lord, or lord of an honour on whom others depend.

CHILBLAINS, in medicine, the ſame with what is otherwiſe called perniones. See the article PERNIO.

CHILD, a term of relation to parent.

CHILD-BED, CHILD-BIRTH, } See DELIVERY.

CHILDERMAS-DAY, or INNOCENT'S-DAY, an anniverſary held by the church, on the 28th of December, in commemoration of the children at Bethlehem, maſſacred by order of Herod.

CHILIAD, denotes a thouſand of any things, ranged in ſeveral diviſions, each whereof contains that number. Thus the tables of logarithms are ſo called, becauſe they were at firſt divided into thouſands.

CHILIARCHA, or CHILIARCHUS, in antiquity,

ty, a military officer who had the command of a thouſand men.

CHILIASTS, in church hiſtory, the ſame with the millenarians. See the article MILLENARIANS.

CHIMERA, or CHIMÆRA, a fabulous monſter which the poets feign to have the head of a lion, the body of a goat, and the tail of a dragon; and add, that this odd beaſt was killed by Bellerophon.

CHIMES *of a Clock*, a kind of periodical muſic, produced at equal intervals of time, by means of a particular apparatus added to a clock.

In order to calculate numbers for the chimes, and adapt the chime-barrel, it muſt be obſerved, that the barrel muſt turn round in the ſame time that the tune it is to play require in ſinging. As for the chime-barrel, it may be made up of certain bars that run athwart it, with a convenient number of holes punched in them to put in the pins that are to draw each hammer; and theſe pins, in order to play the time of the tune rightly, muſt ſtand upright, or hang down from the bar, ſome more, ſome leſs. To place the pins rightly, you may proceed by the way of changes on bells, viz. 1, 2, 3, 4; or rather make uſe of the muſical notes. Obſerve what is the compaſs of your tune, and divide the barrel accordingly from end to end.

CHIMNEY, in architecture, a particular part of a houſe, where the fire is made, having a tube or funnel to carry away the ſmoke.

The parts of a chimney are the jambs, or ſides, coming out perpendicularly, ſometimes circularly, &c. from the back; the mantle-tree which reſts on the jambs; the tube, or funnel, which conveys away the ſmoke; the chimney-piece, or moulding, which is on the fore-ſide of the jambs, over the mantle-tree, and the hearth, or fire-place.

CHIMNEY JAMBS, the ſides of a chimney, ſometimes ſtanding out perpendicularly, ſometimes circularly, from the back, on the extremities whereof the mantle-tree reſts.

CHIMNEY-MONEY, or HEARTH-MONEY, a tax impoſed by ſtatute 24 Car. II. expreſſing that every fire-hearth and ſtove of every dwelling or other houſe within England and Wales, except ſuch as pay not to church and poor, ſhall be chargeable with two ſhillings per annum, payable at Michaelmas and Lady-day, to the king and his heirs. This tax being much complained of, as burdenſome to the people, has been aboliſhed, and inſtead of it the window-tax was granted.

CHIMNEY-PIECE, a compoſition of certain mouldings of wood or ſtone, ſtanding on the fore-ſide of the jambs, and coming over the mantle-tree.

CHINA-CHINA, in pharmacy, the ſame with quinquina. See QUINQUINA.

CHINA-ROOT, in the materia medica, is the name of a drug, of which there are two kinds, oriental and occidental. The two plants differ little or nothing in the leaves, flowers, or ſeeds, but conſiderably in the root, and remarkably in the time of flowering; the Chineſe blowing only in June and July, whilſt the American produces flowers ſucceſſively almoſt all the year.

Decoctions of this root drank freely, are ſaid to promote perſpiration and urine, and have been greatly commended in the venereal diſeaſe: they do not appear, however, to have any conſiderable virtue.

The occidental ſort which grows naturally about Carthagena in Spaniſh America, is a ſpecies of the ſmilax; to which article we refer the reader for its generical characters.

CHINA-ROSE. See the article HIBISIUS.

CHINA-WARE, or PORCELAIN, a kind of ware well known in moſt parts of the world. It is formed of an artificial ſubſtance of a nature betwixt earthen-ware and glaſs. It reſiſts fuſion in the fire, when perfect, equally with the firſt; and bears, in like manner, a ſudden change with regard to heat and cold; but at the ſame time has, to a certain degree, the tranſparency, and entirely the cloſe and even texture of the latter. The principle on which the ſubſtance of China is formed is as follows.

There are ſome kinds of earth, which being expoſed to a ſtrong heat, will, after ſome time, fuſe and melt, and acquire the nature of glaſs; while there are others that, on the contrary, reſiſt entirely the action of heat, and remain unaltered by it, at leaſt with reſpect to that degree which can be applied by means of furnaces, or ſuch artificial fires; the firſt of theſe kinds are called vitreſcent earths, the others apyrous. Now theſe two kinds being mixed together, in due proportion, they ſo operate on each other, that a matter, endued with the properties above enumerated, is conſequentially produced: for the vitreſcent earth, though it is prevented by the other from liquifying, ſo as to become fluid, yet melts to ſuch a degree, as to make the parts of the whole cohere and gain a ſemi-tranſparency, while the other affords a body, which, not having any propenſity to melt, hinders a greater liquefaction of the whole, by abſorbing the fluid formed by the other; and gives, conſequently, a proper rigidity or ſtiffneſs to the whole maſs when hot, and at the ſame time prevents its gaining, when become cold, that vitreous grain or texture which would render it more tranſparent, as likewiſe brittle, and apt to crack or fly on any ſudden change with regard to heat or cold.

The original kind of this ware manufactured in China and Japan, was accordingly formed by a compoſition of two earths: the one vitreſcible, which is called by the Chineſe petunſe; the other apyrous, or reſiſting the action of heat, ſo as not to

to ſuffer itſelf to be fuſed, or melted by the heat of a furnace, at leaſt without the addition of ſome very powerful flux, and is called kaolin.

The more perfect imitations of the China ware in Europe have been, in like manner, by the commixture of two kinds of earth. But others, where the true compoſition has not been underſtood, or the proper materials were not to be procured, have been formed of matter, prepared by mixing with the earths ſome vitreous or fluxing ſubſtances, not being duly adapted to the reſiſtance of the earth, the wares for the moſt part, (though ſome of them have been very white, and of a good conſiſtence while in a clayey ſtate for working, and capable of ſuſtaining the heat of the furnace) have yet not been able to bear hot water, when ſuddenly poured upon them, while they are cold, without cracking or ſuffering a ſeparation of their parts.

The qualities of China ware, when perfectly good, are, to be very white and tenacious, ſo as not only to bear violence without breaking, and ſtrike fire with the ſteel as flint; but, as is ſaid before, to ſuffer boiling water to be poured on it, while it is itſelf in a cold ſtate, without being broken or cracked: to have a ſemi-tranſparent appearance; to break without ſhewing any grain in the divided parts, but ſeeming to have in them the even texture of glaſs; to ſhine on the exterior ſurface, as if a bright poliſh had been given to it: to be completely fit, while the compoſition is in the ſtate of a moiſt paſte, before it be dried or baked, to be modelled or caſt with the greateſt nicety and minuteneſs, retaining the figure, though wrought into the moſt thin and ſlender parts; to dry afterwards without warping; and to undergo at laſt the baking or burning, without any ſeparation of the parts or flawing. If the compoſition, or the ware formed of it, be deficient in any of theſe particulars, they are ſo far faulty: and by examining any pieces of China with regard to thoſe particulars, which relate to the finiſhed ware, the comparative or abſolute goodneſs may be eaſily diſtinguiſhed.

The baking or burning China ware is performed much in the ſame manner, as is practiſed by the potters for earthen-ware; except that it is done with more care; and that ſome expedients are uſed for defending the pieces from the injury of the ſmoke or duſt of the furnace, which would deprave the colour, or infect the ſurface with ſpecks.

The glazing the ware of this kind is a very important part of the manufacture of it; and has been generally found the moſt difficult to be performed. It is done by ſpreading ſome ſoft glaſs powdered, or ſome fluxing compoſition, (either mixed with part of the matter, of which the ware itſelf is formed, or in ſome caſes without) on the ſurface of the pieces; and melting it there, ſo as when cold, to make an entire covering with the ſmoothneſs and ſhining appearance of glaſs.

The painting and gilding China ware is much the ſame as in the caſe of enamel, except in ſome particulars; as not only the ſame compoſitions for colours ſerve equally well for both, but the manner of burning or fuſing them is alſo alike, allowing for the difference of the figures of the pieces, and the number of them generally required to be burnt together. On this part of the manufacture, the value of the ware in general moſtly depends, tho' it is indeed, properly conſidered, not a part of the art of making China-ware, but an auxiliary art employed only for the giving additional ornaments to it, being in fact only enamel painting applied to this purpoſe.

CHIN-COUGH, a convulſive kind of cough, which children are chiefly ſubject to, proceeding from a tough, viſcid, and acid matter, lodged in the coats of the ſtomach, which when they vomit, they are eaſy for a time.

Sometimes this diſorder proceeds from a more dangerous cauſe, which is a certain ſalt communicated to tender bodies by means of the air, which coagulates the lymph, and, which growing ſharp and ſtagnating, affects the larynx.

In the cure of this cough, particular care ſhould be had to the ſtomach; and without a vomit the cure can hardly be effected. Spermaceti in broth is of excellent uſe: but by bleedings and repeated purges this cough may be cured, without other means; yet the milder cathartics ought here to take place. Drinks and liquid aliments ſhould alſo be taken in leſs quantity than uſual.

CHINE, in the manege, the ſame with a horſe's backbone.

CHINESE, ſomething belonging to the empire of China, or its inhabitants.

CHIONANTHUS, in botany, a ſhrub which grows by the ſide of rivulets in South-Carolina, to about the height of nine or ten feet, the leaves of which are about the ſize of the laurel, but much thinner in ſubſtance. The flowers are monopetalous, the tube of which is very ſhort and ſpreading; the upper part of which is cut into four very long ſegments, which are erect, acute, of a linear figure, and ſomewhat uneven: in the tube of the petal are inſerted two ſhort filaments, terminated with erect cordated antheræ; the fruit is an unilocular roundiſh black berry, containing a ſtriated hard ſeed. Theſe come out in May, hanging in long bunches, and of a pure white, from which the inhabitants give it the appellation of ſnow-drop-tree; and from the flowers being cut into narrow ſegments, it is called by ſome the fringe-tree.

This plant is propagated here by ſowing the ſeeds. For the firſt two or three winters they require ſhelter; afterward they will bear the weather tolerably well.

CHIRAGRA, in medicine, a term uſed to denote the gout in the hand or wriſt. See the article GOUT.

CHIROGRAPH, *Chirographum*, in the time of the Saxons, ſignified any public inſtrument of gift or conveyance, atteſted by the ſubſcription and croſſes of witneſſes.

CHIROGRAPH was alſo anciently uſed for a fine: the manner of engroſſing the fines, and cutting the parchment in two pieces, is ſtill retained in the chirographer's office.

CHIROMANCY, χειρομαντεια, a ſpecies of divination, drawn from the different lines and lineaments of a perſon's hand; by which means, it is pretended, the inclinations may be diſcovered.

CHIRONIA, in botany, a genus of plants; the corolla is formed of a ſingle petal, and is equal; the tube is roundiſh, and of the ſize of the cup; the limb is divided into five equal oval ſegments, and patent; the fruit is of an oval figure, and contains two cells; the ſeeds are numerous and ſmall.

CHIRONOMY, *Chironomia*, in antiquity, the art of repreſenting any paſt tranſaction by the geſtures of the body, more eſpecially by the motions of the hands. This made a part of a liberal education; it had the approbation of Socrates, and was ranked by Plato among the political virtues.

CHIROTONY, *Chirotonia*, among eccleſiaſtical writers, denotes the impoſition of hands uſed in conferring prieſtly orders. See the article ORDER.

CHIRURGERY, or SURGERY, is that part of medicine which is employed in manual operations.

The word is formed from the Greek, χειρ, the hand, and εργον, work.

Chirurgery is undoubtedly very ancient, but its inventor is very uncertain. Some attribute it to Apis, king of Egypt, though, perhaps, on no good foundation. But, be that as it will, it is certain that during the firſt ages it was nearly the ſole medicine, and conſequently it preceded phyſic in point of time. In the days of Hippocrates, ſurgery was ſo connected with medicine, that the former was ſcarce diſtinguiſhed from the latter by any peculiar and diſcriminating name: and that Hippocrates himſelf aſſiſted the ſick by manual operation, is a fact which cannot be called in queſtion. During theſe laſt forty years, ſurgery has been cultivated with very great ſucceſs. M. le Dran has furniſhed us with inſtructions which will inform the moſt ſkilful proficients. M. de la Faye, the ingenious commentator on Dionis, has likewiſe given us, in his notes, not only what his own experience and reflections have ſuggeſted, but alſo, as he ſays, the opinions and obſervations of the greateſt ſurgeons at Paris; and indeed the frequent mention he makes of Meſſ. Morand, Petit, de la Peyronie, and others, are ſufficient proofs that his comments are an exact repreſentation of the preſent ſtate of ſurgery in France. M. Garengeot's treatiſe on the operations of ſurgery lies under the diſadvantage of having been publiſhed ſome years ſince, and before many of thoſe improvements were made, which are now univerſally known: it, however, contains ſeveral caſes and remarks well worth the attention of a ſtudious reader. Heiſter's ſurgery is in every perſon's hands; and the character of Heiſter is ſo well eſtabliſhed, that any account of that work is needleſs. Nor need we mention the treatiſe of ſurgery, and critical enquiry, of the ingenious Mr. Sharp, ſince the name of the author is abundantly ſufficient.

If the reader deſires a more particular account of chirurgical authors, we refer him to Heiſter's Surgery, where he will find a very large catalogue of them.

CHISLEY-Land, in agriculture, a ſoil of a middle nature, between ſandy and clayey land, with a large admixture of pebbles.

CHISSEL, an inſtrument much uſed in carpentry, maſonry, joinery, ſculpture, &c. and diſtinguiſhed according to the breadth of the blade into half-inch chiſſels, quarter-inch chiſſels, &c. They have alſo different names, according to the different uſes to which they are applied; as, 1. The former, uſed by carpenters, &c. juſt after the work is ſcribed: it is ſtruck with a mallet. 2. The paring-chiſſel, which is uſed in paring off the irregularities made by the former: this is preſſed by the workman's ſhoulder. 3. The ſkew-former cleanſes acute angles with the point of its narrow edge. 4. The mortice-chiſſel, uſed in cutting deep ſquare holes in wood, for mortices: it is narrow, but thick and ſtrong, to endure hard blows. 5. Socket-chiſſels, having their ſhank made with a hollow ſocket at top, to receive a ſtrong wooden ſprig fitted into it with a ſhoulder. 6. Ripping-chiſſel, having a blunt edge, with no baſil, uſed in tearing two pieces of wood aſunder. And, 7. The gouge. See the article GOUGE.

CHITUA, in the materia medica, a kind of lignum aloes, of a reddiſh colour. See the article LIGNUM-ALOES.

CHIVALRY, in law, is a tenure of ſervice, whereby the tenant is bound to perform ſome noble or military office to his lord; and is either regal, when held only of the king; or common, ſuch as may be held of a common perſon as well as the king: the former is properly called ſerjeantry, and the latter eſcuage. Sne the articles SERJEANTRY and ESCUAGE.

A ſtatute of Charles II. aboliſhes all tenures by chivalry, in capite, &c. and ordains that all tenures ſhall be conſtrued to be free and common ſoccage.

CHIVES, or CIVES, a very ſmall ſort of onion. Theſe never produce any bulbs; and ſeldom grow above ſix inches high in the blade, which is ſmall and ſlender.

They are increaſed by parting the roots; and were formerly much uſed in ſpring-ſallads; but of late years have been little noticed.

CHLORITES, in natural hiſtory, a kind of

green

green jaſper; but almoſt as pellucid as the coarſer emeralds. See JASPER.

CHLOROSIS, in medicine, a diſeaſe commonly called the green ſickneſs, incident to girls, maids, widows, and even wives, whoſe huſbands are deficient.

Various are the ſymptoms of this diſorder, as a feveriſh habit of body, vomiting, difficulty of breathing, and longing for unnatural foods.

As to the cure, Aſtruc recommends borax, mineral waters, electuaries made of preparations of ſteel, the martial flowers, &c. aſafœtida, aloes and myrrh, emollient baths, frequent evacuations, and exerciſe; but above all, matrimony.

CHOCOLATE, in commerce, a kind of paſte, or cake, prepared of certain drugs, the baſis of which is the cacao nut.

CHOIR, that part of the church or cathedral where choriſters ſing divine ſervice: it is ſeparated from the chancel, where the communion is celebrated; and alſo from the nave of the church, where the people are placed: the patron is ſaid to be obliged to repair the choir of the church. It was in the time of Conſtantine that the choir was ſeparated from the nave. In the twelfth century, they began to incloſe it with walls; but the ancient baluſtrades have been ſince reſtored, out of a view to the beauty of architecture.

CHOIR, in nunneries, is a large hall adjoining to the body of the church, ſeparated by a grate, where the nuns ſing the office.

CHOLAGOGUES, medicines which purge the bile.

Of this kind are manna, caſſia, roſes, ſena, rhubarb, aloes, jalap, ſcammony, &c. There is ſome reaſon to think that antimonial medicines act more powerfully on the bile than any other remedies.

CHOLEDOCHUS, in anatomy, is a common epithet for the gall-bladder, the hepatic veſſels, and the common gall duct, which communicates with the duodenum.

CHOLER, or BILE. See BILE.

CHOLERA-MORBUS, in medicine, the ſame with bilious fever. See BILIOUS.

CHOMER, HOMER, or OMER, the ſame with corus. See the article CORUS.

CHONDRILLA, in botany, a plant which grows naturally in France, Switzerland, and Germany, the roots of which run deep into the ground, and ſpread out with thick fibres on every ſide, each of which, when broke, will produce a freſh plant, which renders it in thoſe parts (where it is conſidered as a weed) very difficult to be eradicated. From the root ariſe a number of ſlender ſtalks, which at their bottom are furniſhed with oblong leaves; but thoſe above are narrow and entire. The flower is compound, imbricated, and uniform: the proper one monopetalous, ligulated, linear, truncated, and four or five times dentated. There is no pericarpium. The cup is of a cylindrical figure, containing ſolitary, ovated, compreſſed ſeeds, crowned with down.

It flowers in May, and the ſeeds are ripe in September.

CHONDROGLOSSUM, in anatomy, the name of a pair of muſcles ariſing from the cartilaginous proceſs of the os hyoides, and meeting in the baſe of the tongue, where they are inſerted: this pair is not found in all ſubjects.

CHOPIN, or CHOPINE, a liquid meaſure, uſed both in Scotland and France, and equal to half their pint. See the articles PINT and MEASURE.

CHORD, in geometry, is a right-line connecting the extremities of any arch of a circle.

Line of CHORDS is the chords of a circle projected on a right-line. See *Plane* SCALE.

CHORDS, in muſic, are the ſtrings, or lines, by whoſe vibrations the ſenſation of ſound is excited, and by whoſe diviſions the ſeveral degrees of tune are determined.

They are called cords, or chords, from the Greek, χορδὴ, a name which the phyſicians give to the inteſtines; in regard the ſtrings of muſical inſtruments are ordinarily made of guts, though others are made of braſs or iron wire, as thoſe of ſpinnets, harpſichords, &c.

Chords of gold wire, in harpſichords, yield a ſound almoſt twice as ſtrong as thoſe of braſs: chords or ſtrings of ſteel yield a feebler ſound than thoſe of braſs, as being leſs heavy, and leſs ductile.

The tone of a ſound depends on the time or duration of the ſtroke made on the drum of the ear, by a wave or pulſe of air; for as that is longer or ſhorter, the tone will be more grave or acute: and ſince all pulſes move equally ſwift, the duration of a ſtroke will be proportional to the interval between two ſucceſſive pulſes; and conſequently a ſound is more or leſs grave or acute, in proportion to the length of that interval.

Hence it follows, that all the ſounds, from the loudeſt to the loweſt, which are excited by the vibrations of the ſame body, are of one tone. It likewiſe follows, that all thoſe bodies, whoſe parts perform their vibrations in the ſame or equal times, have the ſame tone: alſo thoſe bodies which vibrate ſloweſt have the graveſt and deepeſt tone, as thoſe which vibrate quickeſt have the ſharpeſt or ſhrilleſt tone.

CHORD, *Corda*, in anatomy, a little nerve compoſed by a combination of ramuli of the fifth and ſeventh pairs, and extended in the manner of a chord, under the membrane of the drum of the ear. See the article TYMPANUM.

CHORDEE, in medicine and ſurgery, a ſymptom attending a gonorrhœa, conſiſting in a violent pain under the frenum, and along the duct of the urethra, during the erection of the penis, which is incurvated

incurvated downwards. These erections are frequent and involuntary.

CHOREA SANCTI VITI, ST. VITUS'S DANCE, in medicine. See the article VITUS'S *Dance*.

CHOREPISCOPUS, or COUNTRY-BISHOP, an assistant to a bishop, first introduced into the church when the dioceses became enlarged by the conversion of the pagans in the country and villages at a distance from the mother-church.

CHOREPISCOPUS is also the name of a dignity in some cathedrals in Germany, signifying the same with chori-episcopus, or bishop of the choir. The first chanter in the church of Cologne is called chori-episcopus.

CHOREUS, in ancient poetry, the same with trochæus or trochee. See the article TROCHEE.

CHORIAMBUS, in ancient poetry, a foot consisting of four syllables, whereof the first and last are long, and the two middle ones are short; or, which is the same thing, it is made up of a trochæus and iambus: such is the word nobilitas.

CHORION, in anatomy, the exterior membrane which invests the fœtus in the uterus: it is thick, spongy, villose, and furnished with a vast apparatus of blood-vessels. It is contiguous to the uterus, and is separable into membranes or parts.

CHOROBATA, or CHOROBATES, a kind of water-level among the ancients, of the figure of the letter T, according to Vitruvius's description.

CHOROGRAPHY, the art of making a map of some country or province.

Chorography differs from geography, as the description of a particular country does from that of the whole earth; and from topography, as the description of a country differs from that of a town or district. See the articles GEOGRAPHY and TOPOGRAPHY.

CHOROIDES, in anatomy, an epithet of several membranes, which on account of the multitude of the blood-vessels resemble the chorion. See CHORION.

CHOROIDES denotes the coat of the eye placed immediately under the sclerotica, the inferior lamella of which is called tunica Ruschiana: it is very full of vessels, and coloured black.

Mr. Le Cat, in his description of the parts of the eye, maintains Mariot's opinion of the choroid coat, and not the retina, being the immediate organ of vision. The retina, according to him, is to the choroid what the epidermis is to the skin.

CHOROIDES is used for a portion of the pia mater. See the article *Pia* MATER.

Plexus CHOROIDES is a convolution of the membranes of the brain, consisting of an assemblage of veins and arteries.

CHORO-FAVORITO, in the Italian music, a chorus in which are employed the best voices and instruments to sing the recitatives, play the ritornellos, &c. It is otherwise called the little chorus, or choro recitante.

CHORUS, in dramatic poetry, one or more persons present on the stage during the representation, and supposed to be by-standers, without any share in the action.

CHORUS, in music, is when, at certain periods of a song, the whole company are to join the singers in repeating certain couplets or verses.

The word chorus is often placed in Italian music, instead of *tutti*, or *da capella*, which mean the grand chorus. When after chorus we meet with 1°, or *primo*, we must understand that it is to be played in the first chorus; if 2°, II°, or *secondo*, in the second; and, consequently, that the composition is for eight voices or different parts.

CHOSE, in the common law, is used with various epithets: as,

CHOSE *in Action* is an incorporeal thing, and only a right, as an annuity, bond, covenant, &c. and generally all causes of suit, for any duty or wrong, are accounted choses in action.

Choses in action may be also called choses in suspence, as having no real existence, and not being properly in our possession.

CHOSE LOCAL is any thing that is annexed to a place, such as a mill, &c.

CHOSE TRANSITORY, something moveable, and which may be taken away, or carried from place to place.

CHOUAN, in commerce, the Levant name for the seed of a species of santolina, known among us by that of carmine seed, from its being often used in the preparation of that drug.

CHOUGH, or CORNISH CHOUGH, in ornithology, a species of corvus, otherwise called coracias. See the articles CORVUS and CORACIAS.

CHRISM, χρισμα, oil consecrated by the bishop, and used in the Romish and Greek churches in the administration of baptism, confirmation, ordination, and extreme unction.

CHRISM-PENCE, a tribute anciently paid to the bishop by the parish clergy for their chrism, consecrated at Easter for the ensuing year: this was afterwards condemned as simonaical.

CHRIST, Χριστος, an appellation usually given to our Saviour, answering exactly to the Hebrew Messiah, and signifying one that is anointed. See MESSIAH.

Order of CHRIST, a military order, founded by Dionysius I. king of Portugal, to animate his nobles against the Moors.

The arms of this order are gules, a patriarchal cross, charged with another cross argent: they had their residence at first at Castromarin, afterward they removed to the city of Thomar, as being

Near

nearer to the Moors of Andaluſia and Eſtremadura.

CHRIST is alſo the name of a military order in Livonia, inſtituted in 1205, by Albert biſhop of Riga. The end of this inſtitution was to defend the new Chriſtians, who were converted every day in Livonia, but were perſecuted by the heathens. They wore on their cloaks a ſword with a croſs over it, whence they were alſo denominated Brothers of the Sword.

CHRIST-THORN, in botany, a name given to the paliurus, a ſpecies of rhamnus. See the article RHAMNUS.

CHRISTENING, denotes the ſame with baptiſm. See the article BAPTISM.

CHRISTIAN, in a general ſenſe, ſomething belonging to Chriſt.

CHRISTIAN RELIGION, that inſtituted by Jeſus Chriſt.

CHRISTIANS, thoſe who profeſs to believe and practiſe the Chriſtian religion, and are baptized in the name of Jeſus Chriſt.

CHRISTIANS *of St. John*, a ſect of Chriſtians very numerous in Balſora, and the neighbouring towns: they formerly inhabited along the river Jordan, where St. John baptized, and it was from thence they had their name.

CHRISTIANS *of St. Thomas*, a ſort of Chriſtians in a peninſula of India, on this ſide of the gulf: they inhabit chiefly at Cranganor, and the neighbouring country: theſe admit of no images, and receive only the croſs, to which they pay great veneration.

CHRISTMAS, a feſtival of the Chriſtian church, obſerved on the 25th of December, in memory of the nativity of Jeſus Chriſt.

CHRISTMAS-ROSE, in botany, a name ſometimes given to a ſpecies of black hellebore. See the article HELLEBORE.

CHRISTOLYTE, in church-hiſtory, a ſect of Chriſtian heretics, who maintained that Chriſt deſcended into hell, body and ſoul, and that he left both there, aſcending into heaven with his divinity alone.

CHRISTOMACHI, an appellation given to all heretics, who deny Chriſt's divinity, or maintain heterodox opinions concerning his incarnation.

CHRITOPHORIANA, in botany. See ACTEA.

CHROMATIC, in the ancient muſic, the ſecond of the three kinds into which the conſonant intervals were ſubdivided into their concinnous parts. The other two kinds are enharmonic and diatonic. See the articles ENHARMONIC, &c.

CHROMATIC, in painting, a term uſed to ſignify the colouring, which makes the third part in the art of painting.

CHRONIC, or CHRONICAL, among phyſicins, an appellation given to diſeaſes that continue a long time, in contradiſtinction to thoſe that ſoon terminate, and are called acute.

CHRONICLE, *χρονικον*, in matters of literature, a ſpecies or kind of hiſtory, diſpoſed according to the order of time, and agreeing in moſt reſpects with annals. See the article ANNALS.

Books of CHRONICLES, in the canon of Scripture, two ſacred books, called by the Greeks, *paralipomena*, *παραλειπομενα*; that is, remains, additions, or ſupplements, as containing many circumſtances omitted in the other hiſtorical books.

CHRONOGRAM, *χρονογραμμα*, a ſpecies of falſe wit, conſiſting in this, that a certain date or epocha is expreſſed by numeral letters of one or more verſes.

CHRONOLOGY, as it is commonly accepted, is the arithmetical computation of time for hiſtorical uſes, that thereby the beginnings and endings of princes reigns, the revolutions of empires and kingdoms, battles, ſieges, or any other memorable events or actions may be truly ſtated.

Strumius divides chronology into five diſtinct branches, viz. metaphyſical, phyſical, political, hiſtorical, and eccleſiaſtical, according to the various relations or habitudes wherein time is conſidered, that is, as in itſelf, as connected and ſubjected to the affections, ſtates, and alteration of natural things, as accommodated to civil uſes, as matched with events that paſs in the world, and particularly as it relates to the celebration of Eaſter.

To be a good chronologiſt, requires not only the knowledge of aſtronomy and geography, and conſequently that of arithmetic, geometry, and trigonometry, both plain and ſpherical, but alſo cloſe application to the ancient monuments.

Sir Iſaac Newton, in order to ſettle the grand epocha of the Argonautic expedition, makes uſe of the following principles.

He obſerves, that Eudoxus, in his deſcription of the ſphere of the antients, placed the ſolſtices and equinoxes in the middle of the conſtellations Aries, Cancer, Chelæ, and Capricorn; and alſo that this ſphere or globe was firſt made by Muſæus, and the aſteriſms delineated upon it by Chiron, two of the Argonauts. Now it is well known, that by the preceſſion of the equinoxes the ſtars go back 50″ per annum. And ſince, at the end of the year 1689, the equinoctial colure paſſing through the middle point, between the firſt and laſt ſtar of Aries, did then cut the ecliptic in 8 6° 44′, it is evident, that the equinox had then gone back 36° 44′; therefore, as 50″ is to one year, ſo is 36° 44′ to 2645 years, which is the time ſince the Argonautic expedition to the beginning of the year 1690; that is, 955 years before Chriſt, is the æra of the Argonautic expedition.

But our great author is more particular and ſubtile in this affair. He finds the mean place of the colure of the equinoxes and ſolſtices, by conſider-

ing the several stars they passed through among other constellations as follows, according to Eudoxus. In the back of Aries is a star of the sixth magnitude, marked γ by Bayer; in the end of the year 1689, its longitude was $\aleph$ 9° 38′ 45″; and the equinoctial colure passing through, according to Eudoxus, cuts the ecliptic in $\aleph$ 6° 58′ 57″.

In the head of Cetus are two stars of the fourth magnitude, called ν and ξ by Bayer. Eudoxus's colure, passing in the middle betwixt them, cuts the ecliptic in $\aleph$ 6° 58′ 51″, at the end of the year 1689.

In the extreme flexure of Eridanus there was formerly a star of the fourth magnitude (of late it is referred to the breast of Cetus.) It is the only star in Eridanus, through which the colure can pass; its longitude was at the end of the year 1689 γ 25° 22′ 10″, and the colure of the equinox passing through it cuts the ecliptic in $\aleph$ 7° 12′ 40″.

In the head of Perseus, rightly delineated, is a star of the fourth magnitude, called τ by Bayer; its longitude was $\aleph$ 23° 25′ 30″, at the end of the year 1689; and the colure passing through it cuts the ecliptic in $\aleph$ 6° 18′ 57″. Also in the right-hand of Perseus is a star of the fourth magnitude, whose longitude at the end of the year 1689, was $\aleph$ 24° 25′ 27″, and the equinoctial colure passing through it cuts the ecliptic in $\aleph$ 4° 56′ 40″.

Now the sum of all these five places of the colure, viz.

$\aleph$	6°	58′	57″
$\aleph$	6	58	51
$\aleph$	7	12	40
$\aleph$	6	18	57
$\aleph$	4	56	40

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The fifth part of which is = $\aleph$ 6° 29′ 13″, which is therefore the mean place in which the colure did, in the end of the year 1689, cut the ecliptic.

After a like manner he determines the mean place of the solsticial summer colure, to be Ω 6° 28′ 46″, which, as it is just 90° from the other, shews it to be rightly deduced. The equinoxes having then departed 1° 6° 29′ from the cardinal points of Chiron, shews that 2628 years have elapsed since that time, which is more correct than the former number, though less by only seventeen years. See PRECESSION.

By some other methods of a like nature, he also shews the æra of the Argonauts ought to be placed in that age of the world; and having fixed this most antient epocha, he makes his computation, with reference thereto, in the future part of his book.

As to the authors who have written on this science, they are very numerous; among the moderns are Petavius, Vossius, Usher, Sir Isaac Newton, &c. and among the antients, Julius Africanus, Eusebius, &c. There is also an excellent Treatise of Chronology by the learned Strauchius, translated into English by Mr. Sault, F. R. S. and an useful compend by Mr. Wells.

CHRONOMETER, a general name for any instrument used in the measuring of time; in this sense clocks, watches, dials, &c. are chronometers: though there are some other instruments peculiarly called by that name, particularly one described by Mr. Sauveur in his Principles of Acoustics, as likewise one described in Dr. Desagulier's Experimental Philosophy; which is a kind of clock, contrived to measure small portions of time with great exactness, even to the sixteenth part of a second; which is of great use in astronomical observations, the time of the fall of bodies, the velocity of running waters, &c. But these kind of chronometers must not be depended on for any long space of time, except their pendulums be made to vibrate in a cycloid, because all clocks, which have short pendulums, are liable to err more considerably than those with long pendulums.

CHRYSALIS, in natural history, a state of rest and seeming insensibility which butterflies, moths, and several other kinds of insects, must pass through before they arrive at their winged or more perfect state. See BUTTERFLY.

The first state of these animals is in the caterpillar or reptile form: then they pass into the chrysalis-state, wherein they remain immoveably fixed to one spot, and surrounded with a case or covering, which is generally of a conical figure; and, lastly, after spending the usual time in this middle state, they throw off the external case wherein they lay imprisoned, and appear in their most perfect and winged form of butterflies, or flies. See CATERPILLAR.

Through the whole course of this transformation, the animal remains the same, only surrounded with different coverings; in the caterpillar form, it is a kind of fœtus, or embryo, wrapped up in several coats, the limbs of which can only be discovered by the assistance of the microscope: in the chrysalis or nymph-state, it acquires a farther degree of maturity; and then the limbs, wings, &c. become perfectly distinct; and at length it disengages itself, and becomes an inhabitant of the air, adorned with a peculiar kind of plumage: in this last state the two sexes copulate, and the female lays her eggs to be afterwards hatched into caterpillars, and to pass through the like changes with the parent-insect.

CHRYSANTHEMUM, CORN-MARIGOLD, in botany, a genus of plants, producing compound, radiated flowers, the proper hermaphrodite florets are funnel-shaped, and the female, ligulated, oblong, and tridentated; it is destitute of a pericarpium, but the immutated cup contains several solitary, oblong, naked seeds.

There are various species belonging to this genus, one of which grows very common in corn fields;

another species, which is annual, and either with white or yellow-coloured flowers, is cultivated in gardens: these make an agreeable appearance, particularly those with double flowers; a variety of which (called the quilled chrysanthemum) is most esteemed; these may be encreased by cuttings in the summer, and preserved in a green-house in winter.

CHRYSOBALANUS, in botany, a genus of icosandrious plants, the flower of which consists of five oblong, plain, patent petals, inserted in a campanulated cup.

The fruit is an ovated, large unilocular berry, including an ovated nut, with five longitudinal furrows.

There are two species in this genus; but being natives of the warm parts of America, they require a hot-house for their preservation in this climate.

CHRYSOBERYL, a kind of beryl with a tincture of yellow. See BERYL.

CHRYSOCOMA, or CHRYSOCOME, goldy-locks, in botany, a genus of plants, the compound flower of which is tubulous, the proper one of a funnel-form, with a quinquifid limb. There is no pericarpium, but the cup scarcely immutated, contains solitary, ovato-oblong, compressed seeds, crowned with a hairy down.

CHRYSOGONUM, in botany, a genus of plants, the universal flower of which is radiated; the proper hermaphrodite one of a funnel-form, quinquidentated and erect; the female one plain, oblong, truncated, and tridentated. There is no pericarpium: the immutated cup contains solitary, obverso-cordated, quadrangular seeds in the female; the hermaphrodites prove abortive.

CHRYSOLITE, in natural history, a gem which the ancients knew under the name of the topaz; and the true chrysolite of the ancients, which had its name from its fine gold-yellow colour, is now universally called topaz by modern jewellers. See the article TOPAZ.

CHRYSOLITE-PASTE, a kind of glass made in imitation of natural chrysolite, by mixing two ounces of prepared chrystal with ten ounces of red-lead, adding twelve grains of crocus martis made with vinegar; and then baking the whole for twenty-four hours, or longer, in a well-luted crucible.

CHRYSOPHYLLUM, star-apple, in botany, a genus of trees which grows naturally in the West-Indies to the height of twenty or thirty-feet, dividing into many branches. The flowers which are monopetalous and campanulated, come out from the side of the branches, and are succeeded by large globose berries, each containing three or four compressed osseous seeds.

The fruit of these trees are very rough and astringent at first, but by laying some time after they are gathered they become mellow.

The timber is used in the West-Indies for building, and for shingles to cover houses.

CHRYSOPRASUS, or CHRYSOPRASIUS, the tenth of the precious stones mentioned in the Revelations as forming the foundation of the heavenly Jerusalem.

The chrysoprasius is a species of prasius, of a pale but pure green colour, with an admixture of yellow. See PRASIUS.

CHRYSOSPLENIUM, golden saxifrage, in botany, a genus of plants, producing apetalous flowers, each of which contains a coloured premanent calyx, divided into four or five parts, in which is inserted eight or ten erect subulated stamina.

The fruit is an unilocular, two horned capsule, containing a number of very small seeds.

This genus contains two species which grow wild in many parts of England; they flower in March or April.

CHUB, or CHUBB, in ichthyology, the English name of a species of cyprinus, with eleven rays in the pinna ani. See the article CYPRINUS.

CHURCH, has different significations, according to the different subjects to which it is applied. 1. It is understood of the collective body of Christians, or all those over the face of the whole earth, who profess to believe in Christ, and acknowledge him to be the Saviour of mankind.

2. Church is applied to any particular congregation of Christians, who at one time, and in one place, associate together and concur in the participation of all the institutions of Jesus Christ, with their proper pastors and ministers.

3. Church denotes a particular sect of Christians distinguished by particular doctrines and ceremonies.

4. The word church is used to signify the body of ecclesiastics, or the clergy, in contradistinction to the laity.

5. Church is used for the place where a particular congregation or society of Christians assemble for the celebration of divine service.

CHURCH WARDENS, formerly called church-reeves, are officers chosen yearly, in Easter-week, by the minister and parishioners of every parish, to look after the church, church-yard, church-revenues, &c. also to observe the behaviour of the parishioners, in relation to such misdemeanors as appertain to the censure or jurisdiction of the ecclesiastical court.

CHURLE, CEORLE, or CARL, in the time of the Saxons, signified a tenant at will, who held land of thanes, on condition of rent and service. They were of two sorts, one like our farmers that rented the out-land estates, the other which tilled and manured the demesnes, and therefore called ploughmen.

CHYLE, in the animal œconomy, a milky fluid,

fluid, secreted from the aliments by means of digestion.

The principles of the chyle seem to be sulphureous, mucilaginous, saline, and aqueous. It is a kind of natural emulsion, both with regard to the colour, the ingredients, and the manner of preparation. There is this difference between the artificial and natural emulsion, that the latter is far more pure, and is prepared with much greater apparatus, not by the sudden expression of part of the liquid, but by a gentle and successive percolation.

CHYLIFICATION, the formation of the chyle, or the act whereby the food is changed into chyle.

Chylification commences by comminuting the aliment in the mouth, mixing it with saliva, and chewing it with the teeth; by these means the food is reduced into a kind of pulp, which, being received into the stomach, mixes with the juices thereof; and thus diluted, begins to ferment or putrify; and assuming a very different form from what it had before, grows either acid or rancid. Here it meets with a juice separated from the blood by the glands of that part, whose excretory ducts open into the cavity of the stomach; by the commixture of these liquors, whether of saliva, or the juice of the stomach, a proper menstruum is composed, by which the parts of the aliment are still more and more divided by its insinuating into their pores, and acquire still a greater likeness to the animal fluids, and form what is called chyme. The stomach, by means of its muscular fibres, contracting itself, gradually discharges its contents by the pylorus into the duodenum; in which gut, after a small semicircular descent, it meets with the pancreatic juice and bile; both which joining with it, renders some part of the aliment more fluid, by still disuniting the grosser parts from the more pure, and here the chylification is made perfect.

The bile, which abounds with lixivial salts, and apt to entangle with the grosser parts of the concocted aliment, stimulates the guts, and cleanses their cavities of the mucous matter separated from the blood by the glands of the guts, and lodged in their cavities; which not only moistens the inside of the guts, but defends the mouth of the lacteal vessels from being injured by alien bodies, which often pass that way.

The contents of the intestines move still on, by means of the peristaltic motion of the guts; whilst those thinner parts, fitted to the pores of the lacteal vessels, are absorbed by them: the thicker move more slowly on, and by the many stops they continually meet with by the connivent valves, all the chyle or thin parts are at length entirely absorbed; the remains, being merely excrementious, are only fit to be protruded by stool.

In the passage through the small intestines, the finer part of the mass, which we call chyle, as has been already observed, enters the orifices of the lacteal vessels of the first kind, wherewith the whole mesentery is intermixed, which either alone, or together with the mesaric veins, discharge themselves into the glands, at the basis of the mesentery.

Then the chyle is taken up by the lacteals of the second kind, and is conveyed into glands between the two tendons of the diaphragm, called Pecquet's Reservatory, whence it is carried to the heart by the thoracic duct and the subclavian vein: and here it first mixes with the blood, and in time becomes assimilated thereto.

CHYMISTRY, or CHEMISTRY. See the article CHEMISTRY.

CIBOULS, in botany, a small kind of onion, now much in disuse.

CICATRICULA, among natural historians, denotes a small whitish speck in the yolk of an egg, supposed to be the first rudiments of the future chick.

CICATRIX, in surgery, a little seam or elevation of callous flesh rising on the skin, and remaining there after the healing of a wound or ulcer. It is commonly called a scar.

CICELY *Sweet*, in botany, a plant with a perennial, long, thick, soft root, composed of many fibres of a sweet aromatic taste, from which arise many branching stalks, which grow to the height of four or or five feet; these are downy and hollow. The leaves are large, and winged like those of the hemlock, but whiter; they are soft to the touch, a little downy, and have the smell of chervil. The flowers grow in umbels on the tops of the stalks, of a white colour, and a sweet aromatic scent; these appear in May or June, and are succeeded by long, angular, furrowed seeds, having the smell and taste of aniseed, and are ripe in July.

This plant is reckoned a pectoral, and the leaves being dried in the shade, and smoaked like tobacco, is of great efficacy in asthmatic disorders.

It is a native of Germany, but has been long cultivated in England.

For its generical characters, see the article SCANDIX, of which it is a species.

CICER, the chick-pea, in botany, an annual plant, with a slender fibrous root, from whence proceed several stalks; these are hairy, and furnished with conjugated leaves, each composed of seven or nine pair of lobes, serrated on their edges, and terminated by an odd one.

The flowers, which are papilionaceous, proceed from the side of the branches, and are like those of the pea, but smaller. These are white and stand on long foot-stalks; each hath ten stamina, and the fruit is a turgid, swelling pod, of a rhomboidal shape, containing two roundish seeds.

The seeds of this plant are accounted in some measure abstersive, and for that reason are met with in diuretic compositions in the officinal medicines: but they are very seldom found in other prescriptions.

ſions. Chick peaſe was the proviſion of the ancient Hebrews, when they took the field. They parched them, and ſo eat them; and at this day, in Egypt, it is uſual for thoſe who undertake a long journey, to lay in a good ſtock of chick-peaſe, parched in a frying-pan.

CICHORIUM, ſuccory, in botany, a genus of plants, producing compound, plain, uniform flowers; the proper ones are monopetalous, ligulated, truncated, and deeply quinquidentated. The germen is ſituated in a cylindrical calyx, which is connivent at the top, and contains ſolitary, compreſſed ſeeds with acute angles.

All the ſorts of ſuccory are eſteemed aperitive and diuretic, opening obſtructions of the liver, and good for the jaundice; it provokes urine, and cleanſes the urinary paſſages of ſlimy humours. The juice taken in large quantities, ſo as to keep up a gentle diarrhæa, and continued for ſome weeks, has been found excellent againſt the ſcurvy and other chronical diſorders.

CICUTA, water-hemlock, in botany, a poiſonous plant, which grows in ſtanding waters in ſeveral parts of England; it has a branching hollow ſtalk, which is terminated by umbels of yellowiſh flowers. The whole plant greatly reſembles ſmallage; their difference is, that the leaves of this plant are long, ſlender, and deeply cut, commonly into three ſegments, and thoſe of ſmallage are cut in the ſame manner, but the ſegments are ſhort and broad. The roots of this plant are at firſt hollow and green, and lined internally with a ſhining white matter: by age they become harder and more ſolid, and change their green colour to a pale yellowiſh: when full grown, they are as large as the fiſt. They have a number of fibres, like the common celery-root, eſpecially at the bottom, by which they are faſtened to the earth at the bottom of the water wherein they are commonly produced: they are often, however, looſened and carried off by the water; and too often have been taken up and eaten for celery, of which ſeveral melancholy inſtances have happened.

Their poiſonous quality reſides in an orange-yellow juice, which is diſtributed indeed through the whole plant, but accumulated moſt plentifully in the roots.

On a chemical analyſis, both the leaves and roots of this plant are found to contain a large quantity of watery moiſture. Four ounces of the freſh roots were reduced, by drying, to three drams and a half; from which were obtained two drams of ſpirituous and half a dram of watery extract; only one dram of earthy matter remaining from the whole four ounces. The leaves loſt more in drying, and yielded leſs earth than the roots: the quantity of watery extract was two drams from four ounces: the reſiduum gave but half a ſcruple to ſpirit. Sixteen ounces of the leaves yielded in expreſſion ten ounces of juice, which, on being inſpiſſated, left no more than a ſcruple of ſolid matter.

CILIA, the eye-laſhes, in anatomy, are certain rigid hairs ſituated on the arch or tarſus of the eye-lids, and bent in a very ſingular manner.

They are deſtined for keeping external bodies out of the eye, and for moderating the influx of light.

CILIATED *Leaf*, among botanical writers, one ſurrounded all the way with parallel filaments, ſomewhat like the hairs of the eye-lids, whence its name.

CILIARE, or LIGAMENTUM CILIARE, or CILIARIS PROCESSUS, in anatomy, a range of black fibres diſpoſed circularly, having their riſe in the inner part of the uvea, and terminating in the prominent part of the chryſtalline humour of the eye, which they ſurround.

CIMA, or SIMA, in architecture, a member or moulding, called ogee and cymatium.

CIMOLIA TERRA, in natural hiſtory, a ſpecies of white marle, which is ponderous and friable, and makes a conſiderable effervescence with aqua-fortis.

CIMOLIA ALBA, a name given to the hard, heavy, white clay, whereof tobacco-pipes are made.

CINCHONA, in botany, a genus of plants, the flower of which is monopetalous and infundibuliform; the fruit is a roundiſh bilocular capſule, crowned with a cup, and opening into two parts from the baſe to the apex, containing ſeveral oblong, compreſſed, marginated ſeeds.

This is the tree which produces the quinquina, or Peruvian bark. See the article QUINQUINA.

CINCTURE, in architecture, a ring or liſt, at the top and bottom of the ſhaft of a column, ſeparating the ſhaft at one end from the baſe, and at the other from the capital.

That at the bottom is peculiarly called apophyge, as if the pillar took its flight from thence; and that at the top colarin, or collar.

CINERITIOUS, an appellation given to different ſubſtances, on account of their reſembling aſhes, either in colour or conſiſtence: hence it is, that the cortical part of the brain has ſometimes got this epithet. See the article BRAIN.

CINNABAR, in natural hiſtory, is either native or factitious. The native cinnabar is an ore of quick-ſilver moderately compact, very heavy, and of an elegant ſtriated red colour. In this ore the quick-ſilver is blended in different proportions with ſulphur. It is ſo rich an ore, as to be no other than mercury impregnated with a ſmall quantity of ſulphur, juſt enough to reduce it to that ſtate, being commonly more than ſix parts of mercury to one of ſulphur; and even the pooreſt cinnabar yields one half mercury: it is of a very bright glittering appearance, when freſh broken; and is uſually found

found lodged in a bluiſh, indurated clay, though ſometimes in a greeniſh taley ſtone.

Factitious CINNABAR, a mixture of mercury and ſulphur ſublimed, and thus reduced into a fine red glebe. The beſt is of a high colour, and full of fibres, like needles.

Cinnabar is likewiſe uſed by painters as a colour, and is rendered more beautiful, by grinding it with gum-water and a little ſaffron.

There is likewiſe a blue cinnabar, made by mixing two parts of ſulphur with three of quickſilver and one of ſal-armoniac.

CINNABAR *of Antimony*, a preparation of mercury, ſulphur, and antimony, made by ſublimation, ſaid to be a good diaphoretic and alterative.

CINNAMON, *Cinnamomum*, the bark of a tree of the bay kind, growing in the iſland of Ceylon; freed from the outer green or greyiſh part, and cut into long ſlices, which curl up, in drying, into quills or canes, the form in which it is brought to us; very thin, light, of a reddiſh yellow colour, or pale ruſty iron colour, ſomewhat tough in breaking, and of a fibrous texture like wood. It is frequently mixed with another bark, greatly reſembling it in appearance, but much weaker in virtue, *caſia lignea*: this laſt is diſtinguiſhed by the cloſe ſmooth ſurface which it exhibits on being broken, and by its remarkably ſlimy taſte.

This bark is one of the moſt grateful of the aromatics; of a very fragrant ſmell, and a moderately pungent, glowing, but not fiery taſte, accompanied with a conſiderable ſweetneſs, and ſome degree of aſtringency. It is ſaid, that the fine flavour reſides, originally, only in the thin pellicle which lines the interior ſurface of the bark, and which abounds with veſicles of eſſential oil; the reſt of the bark, while freſh, being merely ſubaſtringent, and receiving the flavour, which we find it to have, from the inner pellicle in drying. Accordingly the thinneſt pieces are found to be ſtrongeſt; as containing the largeſt proportion of this active part, and the leaſt of the inert woody matter.

Cinnamon, infuſed in boiling-water in a cloſe veſſel, gives out to the fluid the greateſt part of its virtue; together with a reddiſh brown tincture, deeper or paler, according to the proportion of cinnamon employed. Rectified and proof ſpirit extract its virtues more perfectly than water, and without the aſſiſtance of heat; three ounces of the powdered bark, by cold maceration for a few days, give a ſtrong impregnation to a quart of proof ſpirit.

The aromatic principle of this ſpice is an eſſential oil; which, in diſtillation with water, riſes ſlowly, difficultly, and renders the liquor ſomewhat milky: the water continues to run milky, and gratefully impregnated with the fragrance of the cinnamon, till about a gallon has been drawn off from a pound: when large quantities of the ſpice are ſubmitted to the operation at once, a ſmall portion of the oil commonly ſeparates and ſinks to the bottom of the water; in colour gold yellow; of a delightful ſmell like that of cinnamon itſelf; and of a fiery pungency, ſo as not to be ſafely taſted or applied to the ſkin without dilution; for, as Boerhaave obſerves, it burns to a gangrenous eſchar: in doſes of a drop or two, diluted by the means of ſugar, mucilages, &c. it is one of the moſt immediate cordials and reſtoratives, in languors, ſingultuſes, and all debilities of the vis vitæ. If the milky diſtilled water be long kept, great part of the ponderous oil ſuſpended in it, ſeparates and ſubſides: ſome with a view to the perfection of the water, endeavour to prevent this ſeparation, by adding a ſmall proportion of ſugar, which contributes to keep the oil diſſolved: others, with a view only to the obtaining of the oil, endeavour to promote the ſeparation, by ſetting the liquor in a very cold place, and perhaps by other means not commonly known. It is ſaid, that from ſixteen ounces of good cinnamon, about two drams of oil may be collected.

On diſtilling proof ſpirit from this ſpice, the purely ſpirituous part, which comes over firſt, proves almoſt flavourleſs, but the watery part which follows brings with it the eſſential oil; and this oil being diſſolved by means of the ſpirituous portions, the liquor proves limpid. A cordial water of this kind is commonly prepared in the ſhops, by drawing off a gallon of proof-ſpirit from a pound of cinnamon. A like preparation might be obtained rather more advantageouſly, and free from the foreign flavour which the common proof-ſpirits are accompanied with, by adding to the ſimple water a ſuitable quantity of pure rectified ſpirit.

White CINNAMON, called alſo winter's bark, is the bark of a tree frequent in the iſland of St. Domingo, Guadalupe, &c. of a ſharp biting taſte like pepper. Some uſe it inſtead of nutmeg; and in medicine it is eſteemed a ſtomachic and antiſcorbutic. See WINTERANUS *Cortex*.

CINQUEFOIL, *Quinquefolium*, in botany, the ſame with the potentilla of Linnæus. See the article POTENTILLA.

Cinquefoil roots are eſteemed drying, aſtringent, and antiſebrific; and accordingly have been preſcribed with ſucceſs in agues and fluxes of all kinds.

CINQUE-PORTS, an appellation given to five port-towns, ſituated on the coaſt of Kent and Suſſex, overagainſt France, and famous in Engliſh hiſtory.

The cinque-ports are Haſtings, Dover, Hithe, Romney, and Sandwich; which had large privileges granted them, on account of their former great importance, being then not only the keys of the kingdom, but conſiderable for their maritime ſtrength: thus we are told, that they were

obliged to provide eighty ſhips at their own charge for forty days, as often as the king ſhould have occaſion in his wars.

CINQUE-PORT is alſo a particular kind of fiſhing-net, much uſed in ſtanding water; ſo called on account of the five entrances into it.

CION, or CYON, among gardeners, denotes a young ſprig, or ſprout of a tree.

CION, in anatomy, a name ſometimes uſed for the uvula. See the article UVULA.

CIPHER, or CYPHER, one of the Arabic characters, or figures, uſed in computation, formed thus o.

A cypher of itſelf ſignifies nothing; but when placed to the right of other characters, in whole numbers, it augments their value ten times; and when placed to the left in decimal arithmetic, it leſſens the value in each figure in the ſame proportion.

CIPHER is alſo a kind of enigmatic character, compoſed of ſeveral letters interwoven, which are generally the initial letters of the perſons names for whom the ciphers are intended.

Theſe are frequently uſed on ſeals, coaches, and other moveables. Merchants likewiſe, inſtead of arms, bear a cipher, or the initial letters of their names interwoven about a croſs, of which we have many inſtances on old tombs.

CIPHER denotes likewiſe certain characters diſguiſed and varied, uſed in writing letters that contain ſome ſecret, not to be underſtood but by thoſe between whom the cipher is agreed on.

CIRCÆA, in botany, a plant which grows naturally in ſhady places in many parts of England. This plant hath a creeping root, by which it multiplies greatly. The ſtalks are upright, and furniſhed with heart-ſhaped leaves, placed oppoſite: theſe are of a dark green on their upperſide: but pale underneath. The ſtalks are terminated with looſe ſpikes of flowers, which are branched out into three or four ſmall ſpikes. The flowers are ſmall and white, having but two heart-ſhaped ſpreading petals; oppoſite to which are two erect hairy ſtamina: when the flower is decayed, the calyx becomes a rough oval capſule with two cells, each containing a ſingle oblong ſeed.

CIRCENIAN GAMES, *Circenſes Ludi*, a general term, under which was comprehended all combats exhibited in the Roman circus, in imitation of the Olympic games in Greece.

CIRCLE, in geometry, is a plain figure, comprehended under one line, which is called a circumference, unto which all lines drawn from a point in the middle of the figure called the center, and falling upon the circumference thereof, are all equal the one to the other. Though more properly, it is that ſpace included within the circumference or periphery, that is the circle: however, in the popular uſe of the word, circle is frequently uſed for the periphery alone.

Every circle is ſuppoſed to be divided into 360 equal parts, called degrees; and of all figures is the moſt capacious; that is, contains the greateſt ſpace or area under the leaſt bounds or periphery.

The method of finding the circumference from the diameter or radius being given, is a problem of the greateſt uſe in geometry. The ancients endeavoured to ſolve this propoſition by a continual biſection of the ſides of an inſcribed polygon, till they arrived at a ſide which ſubtended a very ſmall arc: they likewiſe found the ſide of a ſimular circumſcribed polygon; then multiplying each of theſe by the number of ſides of the polygon, they obtained the periphery of each polygon. The ratio of the diameters to the periphery of the circle will be greater than that of the ſame diameter to the perimeter of the circumſcribed polygon; but leſs than that of the inſcribed polygon. The difference of the two being known, the ratio of the diameter to the periphery is eaſily known in numbers very nearly true, though not exactly ſo.

But the eaſieſt way of obtaining the circle's periphery, is by the help of fluxions and infinite ſeries; becauſe the fluxion of the arch is to the fluxion of its tangent in the duplicate ratio of the radius to the ſecant; as may be ſeen demonſtrated in moſt books of fluxions.

The impoſſibility of expreſſing the exact proportion of the diameter of a circle to the circumference, by any received way of notation, and the abſolute neceſſity of having it as near the truth as poſſible, has put ſome of the moſt celebrated men in all ages upon endeavouring to approximate it.

The celebrated Van Culen was the firſt who attempted it with any ſucceſs; for by the ancient method, though ſo very laborious, he carried it to thirty-ſix decimal places, which he ordered to be engraved upon his tomb-ſtone. After him Mr. Abraham Sharp carried it to ſeventy-five places; but Mr. John Machin has carried it to one hundred, which are as follow:

If the diameter of the circle be 1, the circumference will be 3,14159265358979323846264338327950288419716939937510582097494459230781640628620899862803482534211706 79, + which is a degree of exactneſs far more than could ever have been expected. But the ratios generally in uſe are as 7 to 22, as 106 to 333, as 113 to 355, as 1702 to 5347, as 1815 to 5702, or as 1 to 3,14159.

Since then if the diameter of a circle is 1, the circumference will be 3,1415926536— of the ſame parts; and ſince all circles are ſimilar figures, by having the diameter of any circle given, we can find any other part of a circle by the following proportions.

1. As

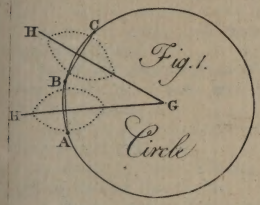


Fig. 1. Circle

Fig. 2. Circumferentor

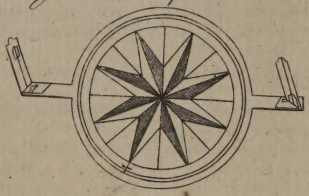
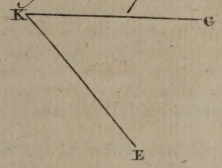


Fig. 3. Circumferentor



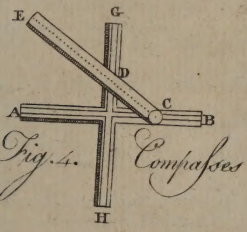


Fig. 4. Compasses

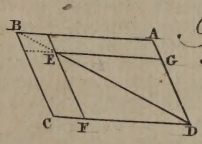


Fig. 5. Complement

Fig. 8. Concave Glass

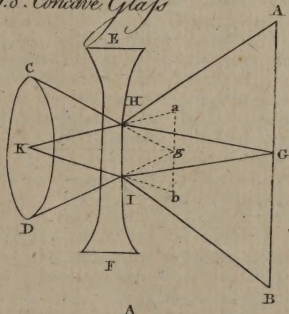
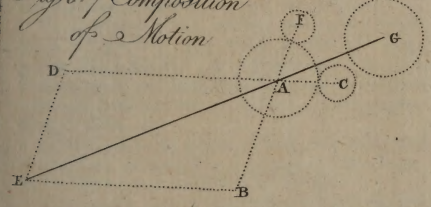


Fig. 6. 7 Composition of Motion



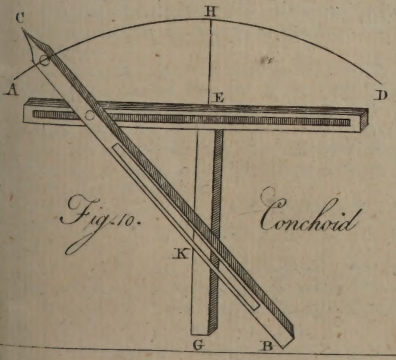


Fig. 10. Conchoid

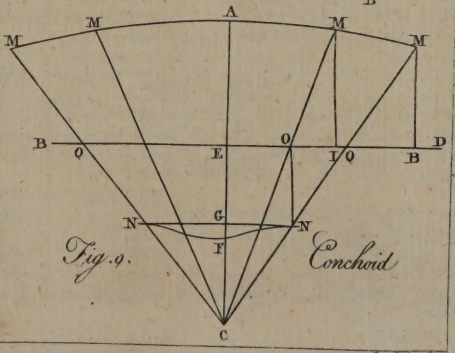


Fig. 9. Conchoid

1. As 1 : 31415926536 : : any given diameter to its circumference.

2. As 1 : ,7854 + : : the ſquare of the diameter given to the area required.

3. As 1 : ,8862 + : : diameter given to the ſide of the ſquare; that is, equal in area to that circle.

4. As 1 : ,7071 : : diameter given : ſide of the inſcribed ſquare.

But if the circumference of any circle be given, any of the other parts may be found by the following proportions.

1. As 1 : ,318309 : : circumference given, to the diameter of that circle.

2. As 1 : ,07958 : : ſquare of the circumference given : area of that circle.

3. As 1 : ,2821 : : circumference given to the ſide of a ſquare = in area to that circle.

4. As 1 : 2251 : : circumference given to the ſide of a ſquare inſcribed in that circle.

Again, having the area of a circle, to find any of the other parts.

1. As 1 : 1,2732 : : area given : ſquare of the diameter of that circle.

2. As 1 : 12,56637 : : area given : ſquare of the circumference of that circle.

3. As 1 : ,6366 : : area given : ſquare of the ſide of the inſcribed ſquare.

We might give many more proportions of the like kind; but the above will be ſufficient with proper application: however, it may not be amiſs to remark, that the area of any circle is equal to half the diameter, multiplied by half the periphery.

To deſcribe a Circle through three given Points, not in a Right-line. Let A B C be the three given points (Plate XXXIV. *fig.* 1.) draw two right-lines from A to B, and from B to C; then divide theſe two right-lines into two equal parts, by the perpendiculars G H.

CIRCULAR, in a general ſenſe, any thing that is deſcribed or moved in a round, as the circumference of a circle, or ſurface of a globe.

The circular form is of all others the beſt diſpoſed for motion, and the moſt capacious.

CIRCULAR LETTER, a letter directed to ſeveral perſons who have the ſame intereſt in ſome common affair.

CIRCULAR LINES, in mathematics, ſuch ſtraight lines as are divided from the diviſions made in the arch of the limb, ſuch as ſines, tangents, ſecants, chords, &c. See the articles SINE and TANGENT.

CIRCULAR NUMBERS, called alſo ſpherical ones, according to ſome, are ſuch whoſe powers terminate in the roots themſelves.

Thus, for inſtance, 5 and 6, all whoſe powers end in 5 and 6, as the ſquare of 5 is 25, the ſquare of 6 is 36, &c.

CIRCULAR SAILING is the method of ſailing by the arch of a great circle. See the article SAILING.

CIRCULAR VELOCITY, in the new aſtronomy, ſignifies the velocity of any planet, or revolving body, which is meaſured by the arch of a circle.

CIRCULATION, the act of moving round, or in a circle: thus we ſay, the circulation of the blood, the circulation of the ſap, &c.

CIRCULATION *of the Blood*, the natural motion of the blood in a living animal, whereby that fluid is alternately carried from the heart into all parts of the body, by the arteries, from whence it is brought back to the heart again by the veins.

This motion is chiefly cauſed by the dilatation and contraction of this organ, and is the principle on which life depends; for when it ceaſes in any part, that part dies; when it is diminiſhed, the operations are weak; and when it ceaſes totally, life is extinguiſhed.

All the veins diſcharge themſelves into the ventricles of the heart; from hence all the arteries ariſe: the blood expelled out of the right ventricle muſt be carried, through the pulmonary artery, into the lungs; from which it muſt be returned, by the pulmonary veins, to the left ventricle; from the left ventricle the blood thus imported is, by the conſtriction of that part, again expelled into the aorta, and by it diſtributed all over the reſt of the body, and thence is returned again to the right ventricle by the cava, which completes the circulation.

This circulation becomes actually viſible, with the aſſiſtance of a microſcope, eſpecially in fiſh, frogs, &c. wherein the inoſculation, or union of the extremities of the arteries with thoſe of the veins, together with the globules of blood flowing from the one into the other, may be plainly ſeen.

The circulation of the blood is generally ſaid to have been firſt diſcovered in England, in the year 1628, by Dr. Harvey, an ingenious and learned phyſician; though there are others who contend for the glory of this moſt important diſcovery. Leonicenus ſays, that Fran. Paoli Sarpi, a Venetian, diſcovered the circulation, but durſt not publiſh his diſcovery for fear of the inquiſition; that he therefore only communicated the ſecret to Fab. ab. Aquapendente, who, after his death, depoſited the book he had compoſed on it, in the library of St. Mark, where it lay a long time, till Aquapendente diſcovered the ſecret to Harvey, who then ſtudied under him at Padua, and who upon his return to England, a land of liberty, publiſhed it as his own. But Sir George Ent has ſhewn, that father Paul received the firſt notion of the circulation of the blood from Harvey's book on that ſubject, which was carried to Venice by the ambaſſador of the republic at the court of England.

The circulation of the blood was altogether unknown to the ancients: they thought that all the blood came from the liver, and that the greateſt part of it paſſed into the vena cava, and ſo into all the branches belonging to it; but in ſuch a manner, that, in coming

coming out from the liver, a conſiderable quantity of it turns about, and enters into the right cavity of the heart, where it is divided into two parts, one of which runs through the vena arterioſa, into the lungs, and the other through the medium ſeptum into the left cavity; where they ſay it is converted into arterial blood, or vital ſpirits, which is carried into the lungs by the arteria venoſa, and all over the body by the arteria magna and its branches.

CIRCULATION *of the Sap of Vegetables* is a natural motion of the nutritious juice of plants from the root to the extreme parts, and thence back again to the root.

CIRCULATION, in chemiſtry, is an operation whereby the ſame vapour, raiſed by fire, falls back, to be returned and diſtilled ſeveral times, and thus reduced into its moſt ſubtil parts.

CIRCULUS, in chemiſtry, an iron inſtrument in form of a ring, which being heated red-hot, and applied to the neck of retorts and other glaſs-veſſels, till they grow hot, a few drops of cold water thrown upon them, or a cold blaſt, will make the necks fly regularly and evenly off.

Another method of doing this, is to tie a thread, firſt dipt in oil of turpentine, round the place where you would have it break; and then ſetting fire to the thread, and afterwards ſprinkling the place with cold water, the glaſs will crack exactly where the thread was tied.

CIRCUMAGENTES MUSCULI, or OBLIQUI MUSCULI, in anatomy, the certain oblique muſcles of the eyes, ſo called from helping to wind and turn the eyes about.

CIRCUMAMBIENT, an appellation given to a thing that ſurrounds another on all ſides; chiefly uſed in ſpeaking of the air. See the article AIR.

CIRCUMCISION, the act of cutting off the prepuce; or a ceremony in the Jewiſh and Mahometan religions, wherein they cut off the fore-ſkin of their males, who are to profeſs the one or the other law.

CIRCUMCISION is alſo the name of a feaſt, celebrated on the firſt of January, in commemoration of the circumciſion of our Saviour.

CIRCUMFERENCE, in a general ſenſe, denotes the line or lines bounding a plane figure. However, it is generally uſed in a more limited ſenſe, for the curve line which bounds a circle, and otherwiſe called a periphery; the boundary of a right-lined figure being expreſſed by the term perimeter.

Any part of the circumference is called an arch, and a right-line drawn from one extreme of the arch to the other, is called a chord.

The circumference of every circle is ſuppoſed to be divided into 360 degrees. The angle at the circumference of a circle is double that at the center. See ANGLE.

For the ratio of the circumference of a circle to its radius, ſee the article CIRCLE.

CIRCUMFERENTOR, an inſtrument uſed by ſurveyors for taking angles.

It conſiſts of a braſs index and circle, all of a piece. The index is commonly about fourteen inches long, and an inch and a half broad; the diameter of the circle is about ſeven inches. On this circle is made a chart, whoſe meridian line anſwers to the middle of the breadth of the index, and is divided into three hundred and ſixty degrees (ſee Plate XXXIV. *fig.* 2.) There is a braſs ring ſoldered on the circumference of the circle, on which ſcrews another ring, with a flat glaſs in it, ſo as to form a kind of box for the needle, ſuſpended on the pivot in the center of the circle. There are alſo two ſights to ſcrew on, and ſlide up and down the index; as alſo a ſpangle and ſocket ſcrewed on the back-ſide of the circle for putting the head of the ſtaff in.

How to obſerve the Quantity of an Angle by the CIRCUMFERENTOR.

Let it be required to find the quantity of the angle EKG (Plate XXXIV. *fig.* 3.) firſt, place your inſtrument at K, with the flower-de-luce of the chart towards you; then direct your ſights to E, and obſerve what degrees are cut by the ſouth end of the needle, which let be 296; then, turning the inſtrument about, direct your ſights to G, noting then alſo what degrees are cut by the ſouth end of the needle, which ſuppoſe 247. This done, always ſubtract the leſſer from the greater, as in this example, 247 from 296, the remainder is 49 degrees, which is the true quantity of the angle EKG.

CIRCUMFLEX, in grammar, one of the accents. See the article ACCENT.

CIRCUMGYRATION, denotes the whirling motion of any body round a center: ſuch is that of the planets round the ſun.

CIRCUMINCESSION, in theology, a term whereby the ſchoolmen uſed to expreſs the exiſtence of three divine perſons in one another, in the myſtery of the Trinity.

CIRCUMLOCUTION, a paraphraſtical method of expreſſing one's thoughts, or ſaying that in many words which might have been ſaid in few.

CIRCUMLOCUTION, in oratory, is the avoiding of ſomething diſagreeable, or inconvenient to be expreſſed in direct terms, by imitating the ſenſe thereof in a kind of paraphraſe, ſo conceived as to ſoften and break the force thereof.

CIRCUM-POLAR STARS, an appellation given to thoſe ſtars, which by reaſon of their vicinity to the pole, move round it without ſetting.

CIRCUMSCRIBED, in geometry, is ſaid of a figure which is drawn round another figure, ſo that all its ſides or planes touch the inſcribed figure.

CIRCUMSCRIBED HYPERBOLA, one of Sir Iſaac Newton's hyperbolas of the ſecond order, that cuts its aſymptotes, and contains the parts cut off within its own ſpace.

CIRCUM-

CIRCUMSCRIBING, in geometry, denotes the deſcribing a polygonous figure about a circle, in ſuch a manner, that all its ſides ſhall be tangents to the circumference.

Sometimes the term is uſed for the deſcribing a circle about a polygon, ſo that each ſide is a chord; but in this caſe it is more uſual to ſay the polygon is inſcribed, than the circle is circumſcribed.

CIRCUMSCRIPTION, in natural philoſophy, the termination, bounds, or limits of any natural body.

CIRCUMSPECTE AGATIS, in law, a ſtatute preſcribing certain caſes to the judges, wherein the king's prohibition does not lie.

CIRCUMSTANCE, particularity which, tho' not eſſential to any action, yet doth ſome way affect it.

CIRCUMSTANTIBUS, in law, a term uſed for ſupplying and making up the number of jurors, in caſe any impannelled appear not, or appearing, are challenged by either party, by adding to them ſo many of the perſons preſent, as will make up the number, in caſe they are properly qualified.

CIRCUMVALLATION, *the Line of*, a fortification of earth, conſiſting of a parapet and trench, which are made round the town intended to be beſieged, when any moleſtation is apprehended from parties of the enemy, which may march in order to relieve the place.

Before the attack of a place is begun, care is to be taken to have the moſt exact plan of it poſſible, and upon this, the line of circumvallation, and the attack, are projected. The line of circumvallation, being a fortification oppoſed to an enemy that may come from the open country to relieve the beſieged, ought to have its defences directed againſt him; that is, ſo as to fire from the town: and beſiegers ought to be encamped behind this line, and between it and the place. The camp ought to be as much as poſſible out of the reach of the ſhot of the place; and the line of circumvallation, which is to be farther diſtant from the place than the camp, ought much more to be out of the reach of its cannon.

As cannon are never to be fired from the rear of the camp, this line ſhould be upwards of 1200 fathoms from the place; we will ſuppoſe its diſtance fixed at 1400 fathoms from the covered-way. The thickneſs or depth of the camp may be computed about 30 fathoms, and from the head of the camp to the line of circumvallation there ought to be a ſpace of 120 fathoms, that the army may be drawn up in order of battle at the head of the camp behind the circumvallation; this diſtance added to the 30 fathoms allowed for the depth of the camp makes 150 fathoms, which being again added to the diſtance of the covered-way from the rear of the camp, makes 1550 fathoms for the diſtance of the circumvallation from the covered-way.

Sometimes alſo an advanced foſſe or ditch is made before the line, about 12 or 15 feet wide, 6 or 7 feet deep, and about 12 or 15 fathoms diſtant from the foſſe of the line. The deſign of this ditch is to ſtop the enemy when he advances to attack the line, and make him loſe time and men in paſſing it. For as it is abſolutely under the fire of the line, the enemy muſt neceſſary loſe many ſoldiers during the time of his paſſage over it; and the paſſing this ditch may alſo ſo break and diſconcert the order of the enemy, as to prevent his attacking with the ſame advantage, as he might have done if he had not been obſtructed by it.

It will be ſufficient to obſerve, with M. *Vauban*,

Firſt, That the circumvallation ought to occupy the moſt advantageous part of the ground before the place; that is to ſay, the moſt eaſy to defend, the moſt difficult to attack, and the moſt adapted to the ſecurity and conveniency of the troops; and that the redans ought to be placed on the moſt eminent places, and not in bottoms.

Secondly, That the cannon of the place do not play upon the rear of the camp.

Thirdly, Never to carry the lines too far into the field, nor to occupy more ground than is neceſſary for the ſecurity of the camp.

Fourthly, To poſſeſs all places from which the line may be commanded, when it may be done without carrying the circumvallation too far; and alſo to conſtruct this line ſo as that it may take advantage of all the declivities, eminences, rivers, moraſſes, and in general of all which may render the acceſs to it more difficult. If there are woods and thickets within its circumference, it may be covered on thoſe quarters by felling the trees.

Fifthly, If there be any rivers or brooks within the circumvallation, which divide the ground into ſeveral parts, care muſt be taken to provide a great number of bridges for the communication of all the quarters, that, in caſe of an attack, they may with eaſe and ſpeed mutually aſſiſt each other.

It is not difficult to trace out theſe lines upon a good topographical chart or plan of the place and country adjacent, ſince nothing more is neceſſary than to carry on all the parts of the line at about 1800 fathoms from the center of the place, and to diſpoſe them in ſuch a manner as that there may be a diſtance of about 120 fathoms from the point of one redan to the point of another.

Nor is there any more difficulty in tracing out theſe lines on the ground, to thoſe who know any thing of practical geometry, it being too eaſy to need an explanation here. See the article CONTRAVALLATION.

CIRCUMVOLUTION, in architecture, ſignifies the torus of the ſpiral line of the Ionic volute.

CIRCUS, in antiquity, a great building of a round or oval figure, erected by the ancients, to exhibit ſhews to the people.

CIRRI, among botaniſts, fine ſtrings of thread like filaments, by which ſome plants faſten themſelves to the walls, trees, &c. ſuch are thoſe of ivy.

CIRRI, in ichthyology, certain oblong and ſoft appendages, not unlike little worms, hanging from the under jaws or mouths of ſome fiſhes: theſe cirri, commonly tranſlated beards, afford marks to diſtinguiſh the different ſpecies of the fiſh, on which they are found.

CIRSOCELE, or HERNIA VARICOSA, in ſurgery, a preternatural diſtenſion or divarication of the ſpermatic veins in the proceſs of the peritonæum, immediately above the teſticle, and ſometimes higher up in the ſcrotum, or even in the groin, inſomuch that they reſemble the inteſtines of a bird, and equal the ſize of a gooſe-quill, with varicoſe nodes, by which means the teſticle appears much bigger, and hangs down lower than it ſhould do.

CISLEU, in Hebrew chronology, the ninth month of their eccleſiaſtical, and the third of the civil year, anſwering nearly to our November.

CISSAMPELOS, in botany, a genus of twining plants, which grow in the warmeſt parts of America: they produce male and female flowers on diſtinct plants; thoſe of the male grow in ſhort ſpikes or cluſters, and are of a pale herbaceous colour. They are apetalous, having a monophyllous calyx, divided into four parts with a ſingle ſtyle. The female flowers are produced in long looſe racemi from the ſide of the ſtalks. Theſe have a calix like the male; and inſtead of petals, have four nectariums ſtanding round an hairy oval germen, which afterwards becomes a pulpy globoſe berry, containing a ſingle ſeed.

This genus being tender, requires a hot houſe in this climate, and are the ſame as the caapeba of Plumier.

CISSOID, in the higher geometry, an algebraic curve, firſt invented by Diocles, an ancient Greek geometrician, whence it is peculiarly called the Ciſſoid of Diocles: its chief uſe is for finding two mean proportionals between two given right lines; but Sir Iſaac Newton, in his *Enumeratio linearum tertii Ordinis*, reckons it amongſt one of the defective hyperbolas, being according to him the forty-ſecond ſpecies.

CISSUS, in botany, a genus of plants whoſe flower conſiſts of a polyphyllous ſmall involucrum, with a plane monophyllous cup, which contains four concave petals. The fruit is a rotundated umbilicated berry, containing an officulated roundiſh ſeed.

CISTERCIANS, in church hiſtory, a religious order founded in the eleventh century by St. Robert, a Benedictine. They became ſo powerful, that they governed almoſt all Europe, both in ſpirituals and temporals. Cardinal de Vitri, deſcribing their obſervances, ſays, they never wore ſkins not ſhirts, nor ever eat fleſh, except in ſickneſs; and abſtained from fiſh, eggs, milk, and cheeſe: they lay upon ſtraw beds in their tunics and cowls: they roſe at midnight to prayers: they ſpent the day in labour, reading, and prayer: and in their exerciſes obſerved a continual ſilence. The habit of the Ciſtercian monks is a white robe, in the nature of a caſſock, with a black ſcapulary and hood, and is girt with a woollen girdle. The nuns wear a white tunic, and a black ſcapulary and girdle.

CISTERN denotes a ſubterraneous reſervoir of rain water; or a veſſel ſerving as a receptacle for rain or other water for the neceſſary uſes of a family.

CISTUS, in botany, a genus of plants, the flower of which conſiſts of five large roundiſh patent petals which ſpread open, and contains a number of ſhort, hairy filaments, topped with ſmall, roundiſh antheræ; the fruit is a roundiſh capſule, containing a number of ſmall ſeeds.

There are various kinds of this genus, which are very great ornaments to a garden; their flowers are produced in great plenty all over the ſhrubs, which though of ſhort duration, yet are ſucceeded by freſh ones almoſt every day for above two months ſucceſſively: theſe flowers are many of them about the bigneſs of a middling roſe, but ſingle, and are of different colours.

From a ſpecies of ciſtus, called by C. Bauhine, ciſtus ladanifera, the balſam or gum ladanum, is extracted, which is common in Cyprus, and ſome parts of Arabia; and Tournefort deſcribes the method of gathering this gum in Candia. He ſays, it is bruſhed off the leaves of the ſhrub in a calm day, by a ſort of whip, compoſed of many ſtraps, to which it adheres, and afterwards it is ſcraped off the ſtraps, and made into cakes of different ſizes.

CITADEL, a place fortified with four, five, or ſix baſtions, built on a convenient ground near a city, that it may it command in caſe of a rebellion. The city therefore is not fortified on the part oppoſite to the citadel, though the citadel is againſt the city. The beſt form for a citadel is a pentagon, a ſquare being too weak, and a hexagon too big.

CITATION, in eccleſiaſtical courts, is the ſame with ſummons in civil courts.

CITHARA, in antiquity, a muſical inſtrument, the preciſe ſtructure of which is not known; ſome think it reſembled the Greek delta Δ; and others, the ſhape of a half moon. At firſt it had only three ſtrings, but the number was at different times increaſed to eight, to nine, and laſtly to twenty-four. It was uſed in entertainments and private houſes, and played upon with a plectrum or quill, like the lyre. See the article LYRE.

CITHAREXYLON, in botany, a tree which grows in moſt of the Weſt-Indian iſlands, where it riſes to a great height, the wood of which is much eſteemed for building, being very durable. It riſes with an upright trunk to the height of fifty or ſixty feet, ſending out branches on every ſide; theſe have

have several angles or ribs running longitudinally, and are furnished with oval, lanceolated leaves, serrated on their edges, of a pale or whitish colour on their upper side, and very prominent beneath. The flowers come out from the sides and ends of the branches in loose spikes, each of which are monopetalous and funnel-shaped, divided at the top into five parts, which spread open. The fruit is a roundish, unilocular berry, containing two ovated seeds.

This plant is propagated by seeds or cuttings, and requires a hot-house for their preservation in this climate.

CITIZEN, *Civis*, a native or inhabitant of a city, vested with the freedom and liberties of it.

CITRINUS, in natural history, a kind of sprig crystal, of a fine yellow colour, which being set in rings, is often mistaken for a topaz.

CITRON-TREE, *Citrus*, in botany. See the artle CITRUS.

CITRUL, *Citrullus*, makes a distinct genus of plants, according to some, otherwise called anguria; but Linnæus comprehends it among the cucumbers: it is said to have the same medicinal qualities with the cucurbita or gourd.

CITRUS, or *Citreum*, the citron-tree, in botany, an ever-green plant with a slender trunk, the wood of which is white and hard, and the bark of a pale green colour. The leaves are somewhat like those of the orange, generally blunt, but now and then accuminated. The flowers, which grow on the tops of the branches, are like those of the orange, the petals being more fleshy. The fruit is in shape and size like the orange, but coloured like the lemon, and the juice higher flavoured and more of the perfume in it than either.

Citrons in Italy are not used as an aliment, but as a sauce, and are cut into small slices, as we do lemons, to garnish the dishes, and to squeeze upon the meat; the acid is very agreeable, excites a weak appetite, and helps digestion, when used moderately. It is an excellent remedy against the scurvy, and is a kind of specific to cure that disease; when the gums of persons are ulcerated with this disorder, the juice will perfect a cure.

Citron-juice is also good in burning and malignant fevers, to quench thirst, and to restrain the heat and effervescence of the blood. When the juice is mixed with water, and sweetened with sugar, it makes a fine cooling drink, grateful to the palate, and agrees with both sick and well. The juice of citrons is likewise diuretic, cleanses the kidneys of small gravel, and restrains vomiting proceeding from bilious humours. From the bark and flowers of this plant we have oils, essences, confections, and waters obtained, of which considerable quantities are imported.

The citron-tree is propagated and managed with us in the same manner as the orange-tree, (to which we refer the reader) but being rather more tender than the orange, they should have a greenhouse with a flue in it, to preserve them in winter in this country.

With the citron, Linnæus has classed the orange and lemon, under the general name citrus; but they being distinctly noticed, not only here but in the southern parts of Europe, where they are most plenty, it was thought necessary in this work to mention them separately.

CITY, *Civitas*, or *Urbs*, a large populous town, capital of some country, province, or district, and the see of a bishop.

Town and city are frequently used in a synonymous sense; however, custom seems to have appropriated the term city to such towns as are, or formerly were, the sees of a bishop: hence it is, that Edinburgh, Glasgow, &c. are still called cities, though they are no longer the sees of bishops, since the establishment of presbytery in Scotland.

CIVET, a soft unctuous odoriferous substance, about the consistence of honey or butter; of a whitish, yellowish, or brownish colour, and sometimes blackish, brought from the Brazils, the coast of Guinea, and the East-Indies; found in certain bags situated in the lower part of the belly of an animal of the cat kind. The bag has an aperture externally, by which the civet is shed or extracted. See ZIBETHICUM.

This substance has a very fragrant smell, so strong as, when undiluted, to be disagreeable; and an unctuous subacrid taste. It is used chiefly in perfumes, rarely or never for medicinal purposes, though the singular effects which musk has been lately found to produce may serve as an inducement to the trial. It unites with oils, both expressed and distilled, and with animal fats: in watery or spirituous liquors it does not dissolve, but both menstrua may be strongly impregnated with its odoriferous matter, water by distillation, and rectified spirit by digestion; by trituration with mucilages, it becomes soluble in water.

CIVET-CAT. See ZIBETHICUM.

CIVIC CROWN, *Corona Civica*, was a crown given by the ancient Romans to any soldier who had saved the life of a citizen in any engagement.

This was accounted more honourable than any other crown, though composed of no better materials than oaken boughs.

CIVIL, *Civilis*, in a general sense, something that regards the policy, public good, or peace of the citizens, or subjects of the state; in which sense we say, civil government, civil law, civil right, civil war, &c.

CIVIL, in a legal sense, is also applied to the ordinary procedure in an action, relating to some pecuniary matter or interest, in which sense it is opposed to criminal.

CIVIL-

CIVIL-LAW is properly the peculiar law of each ſtate, country, or city: but what we uſually mean by the civil-law, is a body of laws compoſed out of the beſt Roman and Grecian laws, compiled from the laws of nature and nations, and, for the moſt part, received and obſerved throughout all the Roman dominions for above 1200 years.

The civil-law is uſed in England in the eccleſiaſtical courts, in the courts of the admiralty, and in the two univerſities; yet in all theſe it is reſtrained and directed by the common law.

CIVIL WAR, a war between people of the ſame ſtate, or the citizens of the ſame city.

CIVIL YEAR is the legal year, or the annual account of time, which every government appoints to be uſed within its own dominions; and is ſo called in contradiſtinction to the natural year, which is meaſured exactly by the revolution of the heavenly bodies.

CIVILIAN, in general, denotes ſomething belonging to the civil law; but more eſpecially the doctors and profeſſors thereof are called civilians: of theſe we have a college or ſociety in London, known by the name of Doctors-commons.

CLACK, among countrymen. To clack wool, is to cut off the ſheep's mark, which makes the weight leſs, and yields leſs cuſtom to the king.

CLAIM, in law, a challenge of intereſt in any thing that is in poſſeſſion of another, as claim by charter, deſcent, acquiſition, &c.

CLAIM *of Liberty*, is a ſuit to the king in the court of Exchequer, to have liberties confirmed there by the attorney-general.

Falſe CLAIM is a term uſed in the foreſt-laws, where a perſon claims more than his due, for which he is liable to be amerced.

CLAIR-OBSCURE, CHIARO-SCURO, or CLARO-OBSCURO. See the article CLARO-OBSCURO.

CLAMP, among brickmakers, implies a pile of unburnt bricks built up for burning. Theſe clamps are built much after the ſame manner as arches are built in kilns, viz. with a vacuity betwixt each brick's breadth for the fire to aſcend by, but with this difference, that inſtead of arching, they truſs over, or over-ſpan, that is, the end of one brick is laid about half way over the end of another, and ſo till both ſides meet within half a brick's length, and then a binding brick at the top finiſhes the arch.

CLAMPS, in naval architecture, thick planks in a ſhip's ſide, which ſupport the ends of the beams. See BEAMS.

CLAMPS are alſo ſmall crooked plates of iron, forelocked upon the trunnions of the cannon, to keep them ſteady in their carriages at ſea.

CLAMPS are likewiſe frequently uſed to faſten the maſts or bowſprits of ſmall veſſels and boats.

CLAMP NAILS, ſuch nails as are uſed to faſten on clamps in the building or repairing of ſhips.

CLAMPING, in joinery, is the fitting of a piece of board with the grain, to another piece of board croſs the grain. Thus the ends of tables are commonly clamped to prevent their warping.

CLAP, in medicine, the firſt ſtage of the venereal diſeaſe, more uſually called a gonorrhœa. See GONORRHŒA.

CLAP-BOARD, among coopers, denotes any kind of board proper for making caſks and other veſſels of.

CLAR, or CLAER, among metallurgiſts, denotes the powder of bone-aſhes, kept for covering the inſides of coppels.

CLARENCIEUX, the ſecond king at arms, ſo called from the duke of Clarence, to whom he firſt belonged; for Lionel, third ſon to Edward III. having by his wife the honour of Clare, in the county of Thomond, was afterwards declared duke of Clarence; which dukedom afterwards eſcheating to Edward IV. he made this earl a king at arms. His office is to marſhal and diſpoſe of the funerals of all the lower nobility, as baronets, knights, eſquires, on the ſouth-ſide of the Trent; whence he is ſometimes called Surroy, or South-roy, in contradiſtinction to Norroy.

CLARENDON. The conſtitutions of Clarendon are certain eccleſiaſtical laws drawn up at Clarendon near Saliſbury. They were ſixteen in number, all tending to reſtrain the power of the clergy, and readily aſſented to by all the biſhops and barons, the archbiſhop Becket excepted, who oppoſed them at firſt, but was afterwards prevailed upon to ſign them. Pope Alexander III. declared againſt and annulled moſt of theſe.

CLARET, a name given by the French to ſuch of their red wines as are not of a deep or high colour. See WINE.

CLARET-WINE-APPLE, is fair, and yields plenty of a pleaſant ſharp juice, from whence it has its name, and not from the colour, it being a white apple, but makes a vinous liquor, which, if well ordered, excels moſt other cyders, eſpecially with a mixture of ſweet apples.

CLARICHORD, or MANICHORD, a muſical inſtrument in form of a ſpinnet.

It has forty-nine or fifty ſtops, and ſeventy ſtrings, which bear on five bridges, the firſt whereof is the higheſt, the reſt diminiſhing in proportion. Some of the ſtrings are in uniſon, their number being greater than that of the ſtops. There are ſeveral little mortiſes for paſſing the jacks, armed with braſs-hooks, which ſtop and raiſe the chords inſtead of the feather uſed in virginals and ſpinnets: but what diſtinguiſhes it moſt is, that the chords are covered with pieces of cloth, which render the ſound ſweeter, and deaden it ſo, that it cannot be heard at any conſiderable

siderable distance; whence it comes to be particularly in use among the nuns, who learn to play, and are unwilling to disturb the silence of the dormitory.

CLARIFICATION, in chemistry. See the article DEPURATION.

CLARINO, a trumpet: hence, *a doi clarini*, signifies that a piece of music is to be played by two trumpets. See the articles TRUMPET, CORNET, &c.

CLARION, a kind of trumpet, whose tube is narrower, and its tone acuter and shriller than that of the common trumpet.

CLARION, in heraldry. He bears ruby, three clarions topaz, being the arms of the earl of Bath, by the name of Granville. Guillim is of opinion, that these three clarions are a kind of old-fashioned trumpets; but others say, that they rather resemble the rudder of a ship; others a rest for a lance.

CLARK-GOOSE, in ornithology, a kind of wild goose, found in Zetland.

CLARO-OBSCURO, or CLAIR-OBSCURE, in painting, the art of distributing to advantage the lights and shadows of a piece, both with regard to the easing of the eye, and the effect of the whole piece.

Thus, when a painter gives his figure a strong relievo, loosens them from the ground, and sets them free from each other, by the management of lights and shadows, he is said to understand the claro-obscuro, which makes one of the great divisions or branches of painting, the whole of a picture being resolvable into light and shadow.

CLARO-OBSCURO, or CHIARO-SCURO, is also used to signify a design consisting only of two colours, most usually black and white, but sometimes black and yellow; or it is a design washed only with one colour, the shadows being of a dusky brown colour, and the lights heightened up with white.

The word is also applied to two prints of two colours, taken off at twice, whereof there are volumes in the cabinets of the curious in prints.

CLARY, in botany, the English name of the sclarea of Tournefort, comprehended by Linnæus among the species of salvia, or sage.

Wild CLARY, the same with the horminum of Tournefort; likewise accounted by Linnæus a species of sage.

CLASPERS, among gardeners, the same with what botanists call cirri. See CIRRI.

CLASS, *classis*, an appellation given to the most general subdivisions of any thing: thus animal is subdivided into the classes quadrupeds, birds, fishes, vegetables, &c. which are again subdivided into series or orders; and these last into genera.

CLASS is also used in schools, in a synonymous sense with form, for a number of boys all learning the same thing.

CLASSIC, or CLASSICAL, an epithet chiefly applied to authors read in the classes at schools, and who are in great authority there.

By classical learning may be understood, such an intimacy with the best Greek and Latin writers, as not only enables the reader to see and admire the beauty of their several compositions, but to imitate their manner of writing, to transcribe their spirit and eloquence, and make their diction and their sentiment his own.

CLAVELLATI CINERES, the same with pot-ashes. See the article POT-ASHES.

CLAVICLES, *claviculæ*, in anatomy, are two bones situated transversely and a little obliquely opposite to each other, at the superior and anterior part of the thorax, between the scapula and sternum.

The uses of the clavicles are, 1. To keep the arms from falling too forward upon the breast, and to facilitate several of the motions of the arm. 2. To serve for the place of origin for several muscles. 3. To defend the great subclavian vessels which run under them.

CLAVIS properly signifies a key, and is sometimes used in English to denote an explanation of some obscure passages in any book or writing.

CLAVUS, in antiquity, an ornament upon the robes of the Roman senators and knights, which was more or less broad, according to the dignity of the person: hence the distinction of tunica angusticlavia and laticlavia.

CLAVUS, in medicine and surgery, is used in several significations: 1. Clavus hystericus is a shooting pain in the head, between the pericranium and cranium, which affects such as have the green-sickness. 2. Clavus oculorum, according to Celsus, is a callous tubercle on the white of the eye, taking its denomination from its figure. 3. Clavus imports indurated tubercles of the uterus. 4. Clavus imports a chirurgical instrument of gold, mentioned by Amatus Lusitanus, designed to be introduced into an exulcerated palate, for the better articulation of the voice. 5. Clavus is a callus or corn on the foot: this arises from a too great compression of the cutis, which by this means hardens and forms itself into a knot. The cure is by softening them, and then pulling them out. The pulp of a lemon laid to a corn, and bound on all night, often softens it so by the morning, that it may easily be taken off.

CLAW, among zoologists, denotes the sharp-pointed nails with which the feet of certain quadrupeds and birds are furnished.

CLAY, *argilla*, in natural history, a genus of earths, the characters of which are these: they are firmly coherent, weighty, and compact; stiff, viscid, and ductile to a great degree, while moist; smooth to the touch, not easily breaking between the fingers, nor readily diffusible in water, and when mixed, not readily subsiding from it.

Besides the use of clay for making potter's ware, it is a considerable improver of light and sandy

grounds,

grounds, which, unleſs they be clayed, will bear nothing but rye, with whatever other compoſts they be manured; but once clayed, they will produce oats, barley, peaſe, &c.

CLAY-LANDS, thoſe abounding with clay, whether black, blue, yellow, white, &c. of which the black and the yellow are the beſt for corn.

All clay-ſoils are apt to chill the plants growing on them in moiſt ſeaſons, as they retain too much water: in dry ſeaſons, on the contrary, they turn hard and choke the plants. Their natural produce is weeds, gooſe-graſs, large daiſies, thiſtles, docks, poppies, &c. Some clay-ſoils will bear clover and rye-graſs; and, if well manured, will produce the beſt grain: they hold manure the beſt of all lands, and the moſt proper for them are horſe-dung, pigeon's dung, ſome kinds of marle, folding of ſheep, malt-duſt, aſhes, chalk, lime, ſoot, &c.

CLAYTONIA, in botany, a plant which grows naturally in Virginia. It hath a ſmall, tuberous, dark-coloured root, from whence ariſes in the ſpring, ſeveral ſlender ſtalks about three inches high, each having two or three ſucculent narrow leaves, of a deep green colour. From the top of the ſtalk comes forth four or five flowers in a looſe bunch; each of theſe are compoſed of five white petals, which are emarginated and ſpotted with red on their inner ſide, and contains the ſame number of recurved filaments, which are terminated with oblong incumbent antheræ. The fruit is a roundiſh, trilocular capſule, opening with three elaſtic valves, containing ſeveral roundiſh ſeeds.

CLEATS, in the marine, pieces of wood having one or two projecting ends whereby to faſten the ropes: ſome of them are faſtened to the ſhrouds below for this purpoſe, and others nailed to different places of the ſhip's deck or ſides.

CLEAVERS, *aparine*, in botany, &c. See the article APARINE.

CLECHE, in heraldry, a kind of croſs, charged with another croſs of the ſame figure, but of the colour of the field.

CLEDGE, among miners, denotes the upper ſtratum of fuller's earth.

CLEF, or CLIFF, in muſic, a mark ſet at the beginning of the lines of a ſong, which ſhews the tone or key in which the piece is to begin; or it is a letter marked on any line which explains the reſt. It is called clef, or key, becauſe hereby we know the names of all the other lines, and conſequently the quantity of every degree or interval: but becauſe every note in the octave is alſo called a key, this letter marked is, for diſtinction ſake, denominated the ſigned clef; and by this key is meant the principal note of a ſong, in which the melody cloſes.

There are three ſigned clefs, *c*, *f*, *g*; the clef of the higheſt part in a ſong, called treble, or alt, is *g* on the ſecond, ſometimes on the firſt, and ſometimes on the third line, counting upwards. The clef of the baſs, or loweſt part, is *f*, generally on the fourth line upwards, and often on the ſecond, third, and fifth: for all the other mean parts, the clef in *c*, ſometimes on one, and ſometimes on another line; indeed ſome that are really mean parts are frequently ſet with the clef *g*. See TREBLE, TENOR, and BASS.

CLEFTS, or CRACKS *in the Heels*, a diſeaſe incident to horſes, which comes either by over-hard labour, which occaſions ſurfeits, or by giving them unwholeſome meat, or by waſhing them when hot. For the cure, ſhave away the hair, and apply the oil of hempſeed, or linſeed; and be ſure to keep them clean.

CLEMATIS, virgin's bower, in botany, a genus of plants, the flower of which is compoſed of four looſe oblong petals, having a great number of ſubulated filaments, with antheræ adhering to their ſides: it hath many germina, which are roundiſh and compreſſed, which afterwards become ſo many ſeeds of the ſame form, each crowned with a feather-ſhaped ſtyle. There are various ſpecies belonging to this genus, which have all of them climbing branches, and may be propagated by laying. Some of the ſorts are very agreeable, and proper to run over arbours, &c. particularly thoſe which produce double flowers.

CLEPSYDRA, an inſtrument or machine ſerving to meaſure time by the fall of a certain quantity of water.

The word comes from κλεπτω, *condo*, and ὑδωρ, *aqua*, water.

There have likewiſe been clepſydræ made with mercury.

The Egyptians, by this machine, meaſured the courſe of the ſun. Tycho Brahe, in our days, made uſe of it to meaſure the motion of the ſtars, &c. and Dudley uſed the ſame contrivance in making all his maritime obſervations.

The uſe of clepſydræ is very ancient: they were invented in Egypt under the Ptolemies; as were alſo ſun-dials. Their uſe was chiefly in the winter; the ſun-dials ſerved in the ſummer. They had two great defects; the one, that the water ran out with a greater or leſs facility, as the air was more or leſs denſe; the other, that the water ran more readily at the beginning, than towards the concluſion.

M. Amontons has invented a clepſydra free from both theſe inconveniences, and which has theſe three grand advantages; of ſerving the ordinary purpoſe of clocks; of ſerving in navigation for the diſcovery of the longitude; and of meaſuring the motion of the arteries.

Conſtruction of a CLEPSYDRA. To divide any cylindric veſſel into parts to be emptied in each diviſion of time; the time wherein the whole, and that wherein any part is to be evacuated, being given.

Suppoſe, a cylindric veſſel, whoſe charge of

water

water flows out in twelve hours, were required to be divided into parts to be evacuated each hour. 1. As the part of time 1, is to the whole time 12, so is the same time 12 to a fourth proportional, 144. 2. Divide the altitude of the vessel into 144 equal parts: here the last will fall to the last hour; the three next above to the last part but one; the five next to the tenth hour, &c. Lastly, the 23 last to the first hour.

For since the times increase in the series of the natural numbers 1, 2, 3, 4 5, &c. and the altitudes, if the numeration be in retrograde order from the twelfth hour, increase in the series of the unequal numbers 1, 3, 5, 7, 9, &c. the altitude, computed from the twelfth hour, will be as the squares of the times 1, 4, 9, 16, 25, &c. therefore the square of the whole time 144, comprehends all the parts of the altitude of the vessel to be evacuated. But a third proportional to 1 and 12 is the square of 12, and consequently it is the number of equal parts into which the altitude is to be divided, to be distributed according to the series of the unequal numbers, through the equal interval of hours. Since in lieu of parts of the same vessel, other less vessels equal thereto may be substituted; the altitude of a vessel emptied in a given space of time being given, the altitude of another vessel to be emptied in a given time may be found, viz. by making the altitudes as the squares of the times. Hence we see the method of constructing the clepsydræ used by the ancients.

CLEPSYDRA is also used for an hour-glass of sand, and likewise for a water-clock. See the articles HOUR-GLASS and WATER-CLOCK.

CLERGY, *Clerus*, κληρος, a general name given to the body of ecclesiastics of the Christian church, in contradistinction to the laity.

Benefit of CLERGY, is an ancient privilege, whereby one in orders claimed to be delivered to his ordinary, to purge himself of felony: this purgation was to be by his own oath, affirming his innocency, and the oath of twelve purgators, as to their belief of it, before a jury of twelve clerks: if the clerk failed in his purgation, he was deprived of his character, whereby he became a mere layman; or he was to be kept in prison till a pardon was obtained; but if he purged himself, he was set at liberty.

This was formerly admitted, even in cases of murder; but the ancient course of the law is much altered upon this head. By the statutes of 18 Eliz. cap. vii. clerks are no more committed to their ordinary to be purged; but every man, to whom the benefit of clergy is granted, though not in orders, is put to read at the bar, after he is found guilty and convicted of such felony, and so burnt on the hand, and set free for the first time, if the ordinary or deputy standing by do say, *legit ut clericus*, otherwise he shall suffer death.

CLERK, a word originally used to denote a learned man, or man of letters; whence the term became appropriated to churchmen, who were from thence called clerks or clergymen: the nobility and gentry being usually bred up to the exercise of arms, and none left but the ecclesiastics to cultivate the sciences.

CLERK is also applied to such as by their course of life exercise their pens in any court or office, of which there are various kinds.

CLEROMANCY, κληρομαντεια, a sort of divination, performed by throwing lots, which were generally black and white beans, little clods of earth, or pebbles; also dice, or such like things, distinguished by certain characters. They cast the lots into a vessel, and having made supplication to the gods to direct them, drew them out, and according to the characters, conjectured what should happen to them.

CLIENT, *Cliens*, among the Romans, a citizen who put himself under the protection of some great man, who, in respect of that relation, was called patron. This patron assisted his client with his protection, interest, and goods; and the client gave his vote for his patron, when he sought any office for himself or his friends. Clients owed respect to their patrons, as these owed them their protection.

The right of patronage was appointed by Romulus, to unite the rich and poor together in such a manner, as that one might live without contempt, and the other without envy; but the condition of a client, in course of time, became little else but a moderate slavery.

CLIENT is now used for a party in a law-suit, who has turned over his cause into the hands of a counsellor or sollicitor.

CLINCH, or CLENCH, in naval affairs. That part of a cable, or other rope, which is fastened to the anchor, is called the clinch, and the act of fastening is called clinching.

A peculiar method of fastening a rope to a post, &c. is also called clinching.

CLIMACTERIC, *Annus Climactericus*, among physicians and natural historians, a critical year in a person's life, in which he is supposed to stand in great danger of death.

According to some, every seventh year is a climacteric; but others allow only those years produced by multiplying 7, by the odd number 3, 5, 7, and 9, to be climacterical. These years, they say, bring with them some remarkable change with respect to health, life, or fortune; the grand climacteric is the sixty third year; but some making two, add to this the eighty-first: the other remarkable climacterics are the seventh, twenty-first, thirty-fifth, forty-ninth, and fifty-sixth. The credit of climacteric years can only be supported by the doctrine of numbers introduced by Pythagoras; though many eminent men, both

both among the ancients and moderns, appear to have great faith in it.

CLIMATE, in geography, is a tract of the surface of the earth included between two parallels to the equator, such that the longest day of the lesser parallel exceeds that of the greater by half an hour.

These climates are narrower the farther they are from the equator; therefore supposing the equator the beginning of the first climate, the polar circle will be the end of the 24th climate; for afterwards, the longest day encreases not by half hours, but by days and months. The following table of the climates shews the lengths of the longest days, and the latitude at the ends of each climate, together with the breadth thereof. So that having the climate given, the latitude is found: or having the latitude given, the climate and longest day are found.

Climate.	Length of days. H.	Latitude. ° ′	Breadth. ° ′
1	12½	8.34	8.34
2	13	16.43	7.50
3	13½	23.11	7. 3
4	14	30.47	6. 9
5	14½	36.30	5.17
6	15	41.22	4.30
7	15½	44.29	3.48
8	16	49. 1	3.13
9	16½	51.58	2.44
10	17	54.29	2.17
11	17½	56.37	2.00
12	18	58.26	1.40
13	18½	59.59	1.26
14	19	61.18	1.13
15	19½	62.25	1.01
16	20	63.22	0.52
17	20½	64.06	0.44
18	21	64.46	0.36
19	21½	65.21	0.29
20	22	65.47	0.22
21	22½	66.06	0.17
22	23	66.20	0.11
23	23½	66.28	0. 4
24	24	66.30	0. 1

The difference of climates arises from the different inclination or obliquity of the sphere. The ancients used to reckon the parallel in which the length of the longest day is twelve hours and three quarters, for the beginning of the first climate. It was likewise a custom among them, instead of the method now among us of setting the latitudes of places down in degrees and minutes, to content themselves with saying what climate the place under consideration was situated.

The term climate is vulgarly made use of to signify any country or region differing from one another, either in respect of the seasons, the quality of the soil, or even the manners of the inhabitants, without any regard to the length of the longest day.

CLIMAX, or GRADATION, in rhetoric, a figure wherein the word or expression which ends the first member of a period begins the second, and so on: so that every member will make a distinct sentence, taking its rise from the next foregoing, till the argument and period be beautifully finished: or, in the terms of the schools, it is when the word or expression, which was predicate in the first member of a period, is subject to a second, and so on, till the argument and period be brought to a noble conclusion; as in the following gradation of Dr. Tillotson. "After we have practised good "actions a while, they become easy; and when "they are easy, we begin to take pleasure in them; "and when they please us, we do them frequently; "and by frequency of acts, a thing grows into a "habit; and confirmed habit is a second kind of "nature, and so far as any thing is natural, so far "it is necessary, and we can hardly do otherwise; "nay, we do it many times, when we do not "think of it."

CLINIC, a term applied by the ancient church-historians, to those who received baptism on their death-bed.

CLINIC, in a modern sense, is seldom used but for a quack, or rather for an empirical nurse, who pretends to have learned the art of curing diseases by attending on the sick.

CLINIC MEDICINE, *Medicina Clinica*, was particularly used for the method of visiting and treating sick persons in bed, for the more exact discovery of all the symptoms of their disease.

CLINOIDES, in anatomy, are four small processes in the inside of the os sphenoides, forming a cavity called sella turcica, in the middle of that bone, in which lies the glandula pituitaria.

CLITORIS, or as some call it, *Mentula Muliebris*, in anatomy, a part of the external female pudenda, situated at the angle which the nymphæ form with each other.

CLOACA, in Roman antiquity, the common sewer, by which the filth of the city of Rome was carried away.

CLOACA, in comparative anatomy, imports the canal in birds, through which the egg descends from the ovary in its exit.

CLOCK, a kind of movement, or machine, serving to measure and strike time.

The usual chronometers are watches and clocks: the former in strictness are such as shew the parts of time; the latter, such as publish it striking: though the name watch is originally appropriated to pocket clocks;

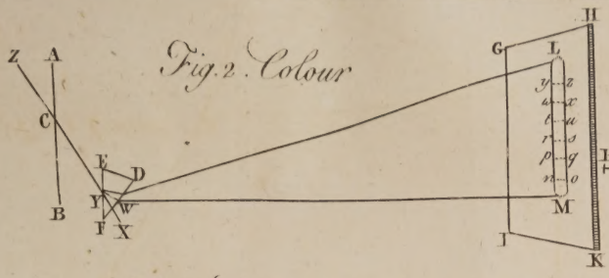


Fig. 2. Colour

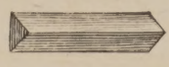


Fig. 1. Colour

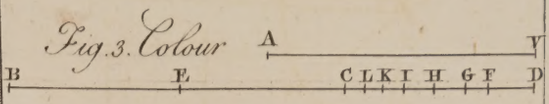


Fig. 3. Colour

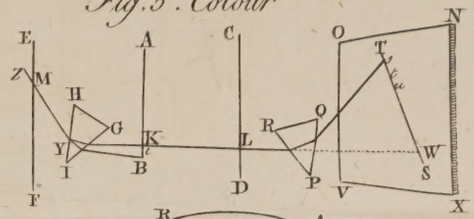


Fig. 5. Colour

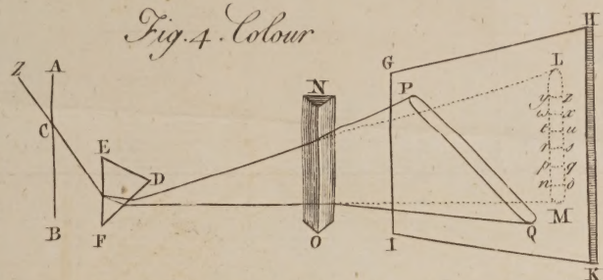


Fig. 4. Colour

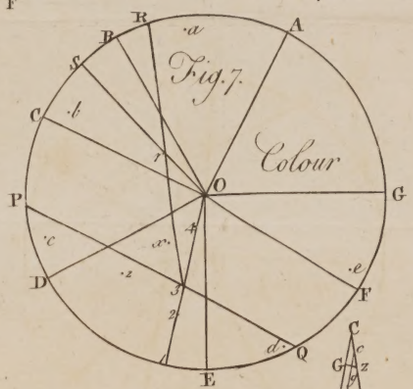


Fig. 7. Colour

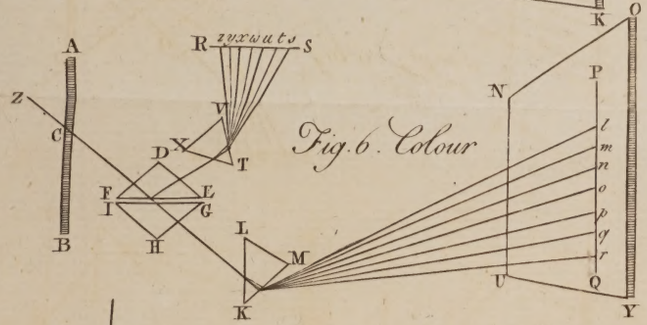


Fig. 6. Colour

Fig. 3.

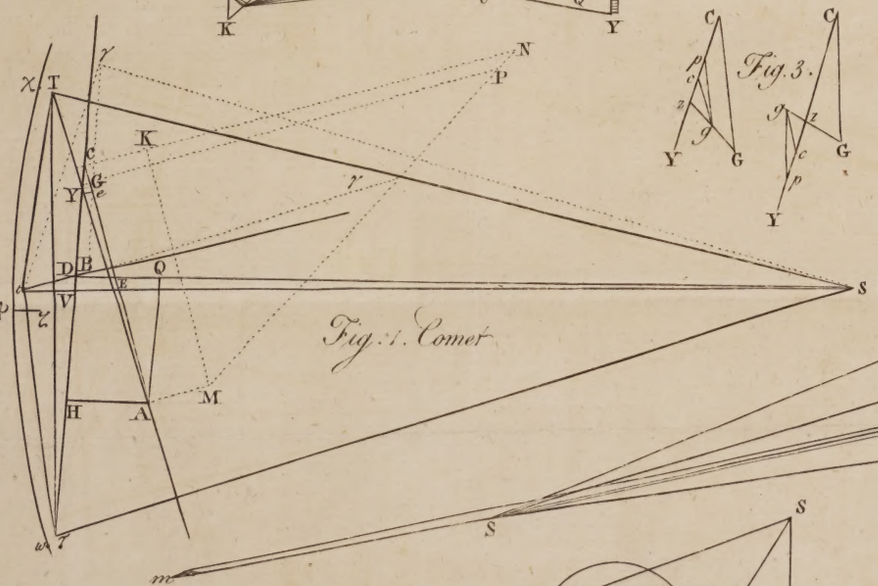


Fig. 1. Comet

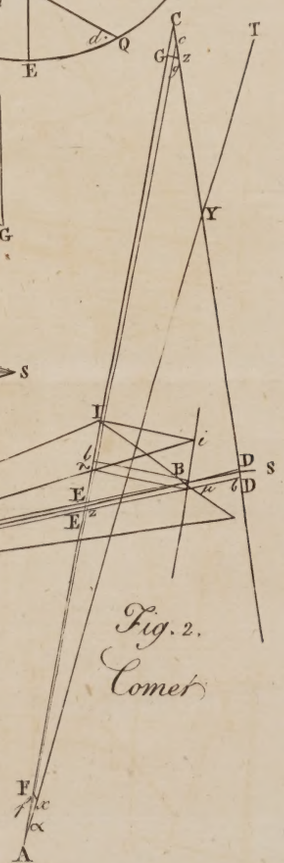


Fig. 2. Comet

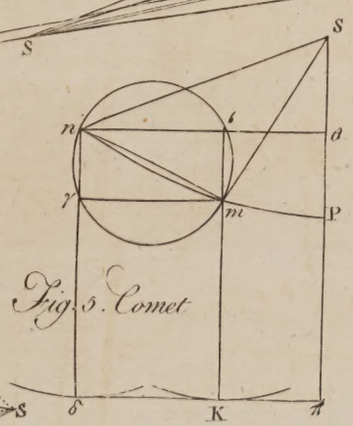


Fig. 5. Comet

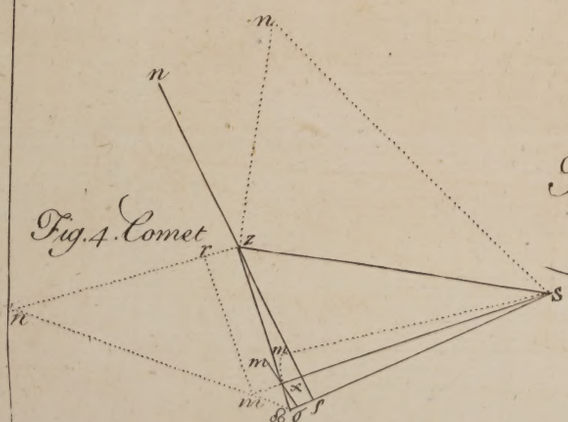


Fig. 4. Comet

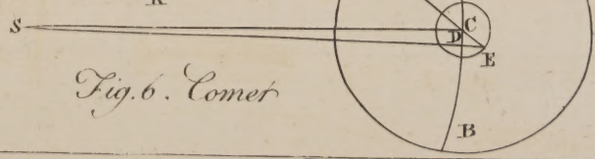


Fig. 6. Comet

T. Lodge Sculp.

in (Plate XXXV. *fig.* 1.) then will the sun's light in passing through this prism suffer different degrees of refraction, and by that means be parted into different rays, which rays, being received upon a clean white paper, will exhibit the following colours, viz. red, orange, yellow, green, blue, indigo, and a violet purple. Thus let AB (Plate XXXV. *fig.* 2.) represent the window-shutter, C the hole in it, DEF the prism, ZY a ray of light coming from the sun, which passes through the hole, and falls upon the prism at Y; and if the prism were removed, would go on to X, but in entering its first surface EF shall be refracted into the course YW, falling upon the second in W, where, in going out into the air, it shall be refracted again.

Let the light now, after it has passed the prism, be received upon a sheet of white paper GHIK, held at a proper distance, and it will exhibit upon the paper a picture or image at LM, of an oblong figure, whose ends are semi-circular, and sides straight. And it shall be variegated with colours after the following manner.

From the extremity M, to some length, suppose to the line *no*, it shall be of an intense red; from *no* to *pq* it shall be of an orange colour; from *pq* to *rs* it shall be yellow; from thence to *tu* it shall be green; from thence to *wx* blue; from thence to *yz* indigo; and from thence to the end violet. And if the whole image be divided lengthwise into 360 equal parts, the red shall take up 45 of them, the orange 27, the yellow 48, the green 60, the blue 60, the indigo 40, and the violet 80.

Sir Isaac Newton, in his Optics, has shewn how, from the refraction of the most refrangible and least refrangible rays, to find the refraction of all the immediate ones. His rule is this; if the sine of incidence be to the sine of refraction in the least refrangible rays, as AV to BC (*fig.* 3.) and to the sine of refraction in the most refrangible, as AV to BD; and if CE be taken equal to CD, and then ED be so divided in F, G, H, I, K, L, that ED, EF, EG, EH, EI, EK, EL, EC, may be proportional to the eight lengths of musical chords, which shall sound the notes in an octave, ED being the length of the key, EF the length of the tone above that key, EG the length of the lesser third, EH of the fourth, EI of the fifth, EK of the greater sixth, EL of the seventh, and EC of the octave above that key; that is, if the lines ED, EF, EG, EH, EI, EK, EL, and EC, bear the same proportion to each other, as the numbers 1, $\frac{8}{9}$, $\frac{5}{6}$, $\frac{3}{4}$, $\frac{2}{3}$, $\frac{3}{5}$, $\frac{9}{16}$, $\frac{1}{2}$, respectively, then shall BD and BF be the limits of the sines of refraction of the violet rays; that is, the violet coloured rays shall not all of them precisely have the same sine of refraction; but none of them shall have a greater sine than BD, nor a less than BF, though there be violet-coloured rays which answer to any sine of refraction that can be taken between these two. In the same manner BF and BG are the limits of the sines of refraction of the indigo; BG and BH are the limits belonging to the blue; BH and BI the limits pertaining to the green; BI and BK the limits for the yellow; BK and BL the limits for the orange-coloured rays; and, lastly, BL and BC, those of the sines of refraction belonging to the red.

And particularly, when light passes out of glass into air, if the sine of its angle of incidence be 50, the sine of the angle of refraction of the red will be between 77 and 77 $\frac{1}{3}$, of the orange-coloured between 77 $\frac{1}{3}$ and 77 $\frac{1}{5}$, of the yellow between 77 $\frac{1}{5}$ and 77 $\frac{1}{3}$, of the green between 77 $\frac{1}{3}$ and 77 $\frac{1}{2}$, of the blue between 77 $\frac{1}{2}$ and 77 $\frac{2}{3}$, of the indigo between 77 $\frac{2}{3}$, and 77 $\frac{7}{9}$, and of the violet-coloured rays between 77 $\frac{7}{9}$ and 78,

To render this proof complete, we must now shew that these dispositions of the rays of light to produce some one colour, and some another, which manifest themselves after being refracted, are not wrought by any action of the prism upon them, but are originally inherent in those rays; and that the prism only affords each species on occasion of shewing its distinct quality, by separating them one from the other, which before, while they were blended together in the unrefracted light of the sun, lay concealed.

This will be proved by the following experiment. Things remaining as in the foregoing one, let another prism, as NO, (Plate XXXV. *fig.* 4.) be placed either close to, or at some distance from the first, in a perpendicular situation, with respect to the former, so that it may refract the rays issuing from the first, sideways. Now, if this prism could separate the light, which falls upon it into coloured rays, as the other did, it would divide the image breadthwise into colours, as before it was divided lengthwise; but no such thing is observable; for the image should only be thrown out of the perpendicular situation LM into the oblique one PQ; the upper parts, which were more refracted in the former case, being more refracted in this; and therefore made to reside farther sidewise from their former situation L, than the lower ones are from M. And farther, each colour shall be uniform from side to side in the oblique image, as well as the perpendicular one.

If there be any objection against the sufficiency of this proof, it must be that the rays, when they fall upon the second prism, are not all in like circumstances with regard to their inclination to its surface; we shall therefore, to obviate that objection, add one more experiment, which seems to be peculiarly adapted to that purpose. It is as follows:

Two boards AB, CD, (Plate XXXV. *fig.* 5.) being erected in a darkened room at a proper distance, one of them AB being near the window-shutter EF, a space being only left for the prism GHI to

be placed between them; so that part of the rays, which enters the hole M, may, after passing through the prism, be transmitted through a smaller hole K, made in the board A B, and passing on from thence to go out at another hole L, made in the board C D, of the same size as the hole K, and small enough to transmit the rays of one colour only at a time. Let another prism P Q R be placed behind the board C D to receive the rays passing through the holes K and L, and after refraction by that prism, let the rays fall upon the white surface S T. Suppose first the violet light to pass through the holes, and to be refracted by the prism P Q R to *s*, which, if that prism were not there, would have passed on to W. If the prism G H I be turned about slowly, so that the incident ray Z Y may fall more obliquely upon it, while the boards and the other prism remain fixed, in a little time another colour, suppose indigo, which we may suppose before to have proceeded to *i*, will pass through the holes K and L; and if the prism P Q R were removed, would proceed like the former rays to the same point W. Now the refraction of this prism will not carry these rays to *s* as it did the other, but to some place less distant from W, as to *i*. But it is manifest, that the holes K and L being in the same situation in each case, both sorts of rays enter the prism P Q R under the same circumstances, for they are equally inclined to its surface R P, and enter it at the same point thereof; which shews that the one species is more diverted out of its course by refraction, than the other is, when the circumstances of incidence are the same in each. Farther, if the prism G H I be turned about till the rays which exhibit blue, pass through the hole L, these will fall upon the surface S T below *t*, as at *u*, and therefore are subject to a less degree of refraction than such as produce indigo. And thus by proceeding, it will be found that the green is less refracted than the blue, and so of the remaining colours, according to the order in which they are represented in an image formed by a single prism. And also each species of rays is disposed to excite in us the idea of a different colour.

This is sufficiently clear from what has been already said, and is farther confirmed by what follows, viz. that whatever species of rays are thrown upon any body, they make that body appear of their own colour. Thus minium in red-light appears of its own colour; but in yellow-light it appears yellow; and in green-light, green; in blue, blue; and in violet-purple-coloured light it appears of a purple colour: in like manner verdigrise will put on the appearance of that colour in which it is placed. But each of these bodies appears most luminous and bright when enlightened with its own colour, and dimmest in such as are most remote from that.

It is certain therefore each ray is disposed to excite its own colour, which is neither to be altered by refraction nor reflection. Thus much in confirmation of the first part of the proposition, viz. that there are different species of light, and that each species is disposed to suffer a different degree of refrangibility, and to excite in us the idea of a different colour. We proceed now to the second part of the proposition, viz.

2. That bodies appear of that colour which results from a composition of those colours which the several species they reflect are disposed to excite.

We have just now seen that each ray, whatever be the colour of the body it is reflected from, is able to excite no other idea than that of its own colour; and that coloured bodies reflect not all the different sorts of rays that fall upon them in equal plenty, but some sorts, viz. those of their own colour, much more copiously than others. We will now proceed to shew, that the other colours may be produced from a mixture of those seven, which rays of light, when separated by a prism, are disposed to exhibit. From whence it will be rational to conclude, the bodies appear of that colour which arises from the mixture of those which they reflect.

1. All the prismatic colours, viz. those that are made by the prism, mixed together, appear white, a little inclining to yellow, such as is that of the sun's light.

To shew this, let a convex lens be placed between the prism and the paper which receives the image, in order that the rays separated by it may be collected into a focus; and let this focus fall upon the paper, then will the spot where it falls appear white. And that the whiteness of this focal point is owing to the union of those colours appears from hence, that if we remove the paper from the focal point, and suffer the rays to cross each other in the focus, and if, when they have proceeded to some distance beyond, they be then received upon the paper, the same coloured image will be exhibited, and inverted, because the rays cross each other in the focus; an evident proof that the whiteness of the spot was owing to nothing but the mixture of the rays constituting the several colours of the image. But if the rays of any particular colour be intercepted before they are collected in the said spot, it then appears not only of a different colour from what it did before, but different from any of the prismatic colours taken separately. Or if the circumference of a wheel be painted with the prismatic colours taken in the same proportion with respect to each other, in which they are exhibited in the image made by the prism, and the wheel be turned swiftly about, the circumference of that wheel shall appear white: if they are taken in other proportions, the colour of the wheel, when turned about, will vary accordingly. From whence this part of the proposition is also abundantly clear.

No composition of these colours will produce black; that being no colour but the defect and absence

fence of all colour whatever. That species of light which is disposed to suffer a greater degree of refraction, requires proportionally less obliquity at the second surface of any medium to occasion a total reflection of it there; so that it is possible that a ray of light may pass through a medium with such obliquity, that only that part of it which is disposed to exhibit a violet colour shall be reflected at the second surface, and all the rest transmitted there. This indeed is a necessary consequence of what was observed concerning the reflection of light at the second surface of any medium, viz. that the reflection of a ray is total, when the obliquity of the incident ray is such, that the angle of refraction ought to be equal to, or exceed a right one. This is a consequence of that, because the angle of the refraction of the violet-coloured light is larger than the angle of refraction of any other, though their angles of incidence are equal. And accordingly thus it happens, as appears by the following experiment.

Let AB (Plate XXXV. *fig.* 6.) represent the window-shutter of a darkened room; C a hole to let in a ray of the sun; DEF, GHI, two prisms so applied together that the sides EF and GI be contiguous, and the sides DF and GH parallel: in this situation light will pass through them without any separation into colours; for the opposite sides being parallel, if the rays are refracted one way where they go in, they will be as much refracted the contrary way where they go out. But if it be afterwards received by a third prism KLM, it will be divided so as to form upon any white body NOYU the usual colours, violet at *l*, indigo at *m*, blue at *n*, and red at *r*. Now let it be supposed that the surfaces EF and GI are not quite close together; but that the rays in passing from one to the other, pass through a medium (viz. the air) of different density from that of the prisms; and that the ray ZC is not so much inclined to the second surface of the first prism as to cause a total reflection of any one species there; then will part only of each species be reflected, and part transmitted.

Let now the reflected rays be received by a fourth prism TXV; these, after passing through it, will paint upon a white surface RS, the colours of the prism, viz. red at *s*, orange at *t*, yellow at *v*, and violet at *z*. Let now the prisms DEF, GHI, be slowly turned about, keeping still the same situation with respect to each other, until the obliquity of the rays ZC to the surface EF be so far increased, that there shall begin to be a total reflection of them there. In which case it is observable, that first of all the violet light will be totally reflected, and will therefore disappear at *l*, appearing instead thereof at *z*, and increasing the violet light which fell there before. And when the rays ZC become more oblique by the prisms being turned farther about, the indigo shall be totally reflected, disappearing at *m*, but falling upon *y*, and making the violet there more intense: and by turning the prisms still farther about, all the remaining colours will be successively removed from the surface PQ to RS.

We are now to enquire what it is that gives bodies this power of reflection, some one sort of rays most copiously, and some another: and this is probably no other than the different magnitude of the particles whereof they are composed, as will appear from the following observations.

If water be prepared with sope so as to render it sufficiently tenacious, and then blown up into a bubble; it is observable, that as the bubble grows thinner and thinner, as it will do by reason of the water's continually running down from the top of it, till it breaks, different colours will arise one after another at the top of the bubble, spreading themselves into rings, and descending till they vanish at the bottom in the same order they arose at the top.

Thus in an experiment of this kind, tried by Sir Isaac Newton, the colours arose in this order; first red, then blue, to which succeeded red a second time, and blue immediately followed; after that red a third time, succeeded by blue; to which followed a fourth red, but succeeded by green; after this a more numerous order of colours, first red, then yellow, next green, and after that blue, and at last purple; then again red, yellow, green, blue, violet, followed each other; and the last order of colours that arose was red, yellow, white, blue; to which succeeded a dark spot that afforded scarce any light, though it was observed to cause some very obscure reflection, for the image of the sun or candle might be faintly discerned in it; and this last spot spread itself more and more till the bubble broke.

Now it is apparent that the only reason why these different colours succeeded each other at the top of the bubble, in the above-mentioned manner, was because its thickness in that part continually varied, till it broke. It remained therefore to examine what was the thickness of the bubble at the top, at the time it exhibited each particular colour: and this was effected by the following contrivance, viz. by taking the object glass of a long telescope, such having but a very small degree of convexity, and placing it upon a flat glass: these glasses, by reason of the convexity of the former, would touch but in one point, and the distance between them, where they did not touch, would be exceedingly small, but larger, the farther we consider it from the point of contact. Now water being put between these glasses, the same colours appeared as in the bubble, in the form of circles or rings surrounding the point where the glasses touched, which point appeared black like the top of the bubble when it is thinnest. Next to this spot lay a blue circle, and next without that a white one, and so on in the same but contrary order to that in which the colours arose on the top of the bubble.

Now

Now the diſtance between the glaſſes, that is, the thickneſs of the body of water between them, where it exhibited any one colour of a particular order, was equal to the thickneſs of the bubble at the time the ſame colour appeared upon it. For though the medium the light muſt paſs through to come at the water is, in one caſe, glaſs, and in the other, air; that makes no difference in the ſpecies of the colour reflected from the water: for pieces of Muſcovy glaſs, made thin enough to appear coloured, would have their colours faded, but not the ſpecies of them altered by being made wet with water: but it was found that tranſparent bodies of different denſity would not under the ſame thickneſs exhibit the ſame colours; for if the forementioned glaſſes were laid upon each other without any water between them, the air between them would then afford the ſame colours as the water, but more expanded; ſo that each ring had a larger diameter, though they bore all the ſame proportion to each other; ſo that the thickneſs of the air, proper to reflect each colour, was in the ſame proportion larger than the thickneſs of the water adapted to reflect the ſame.

Farther, all the light which is not reflected by the thin ſubſtances, whether of air or water contained between the glaſſes, is tranſmitted through them; for when viewed from the other ſide, they exhibit alſo coloured rings as before, but in a contrary order; for the middle ſpot, which in the other view appears black for want of reflecting light, now looks perfectly white; next without this ſpot the light appears tinged with a yellowiſh red; where the white appeared before, it now ſeems black, and ſo of the reſt.

It is farther obſervable that the forementioned thin plates, whether of air or water, did not appear of the ſame colour when viewed obliquely, as when ſeen direct; for if the rings and colours between a convex and plain glaſs be viewed firſt in direct manner, and then under different degrees of obliquity, the rings will be obſerved to dilate themſelves as increaſed. But a plate of air between the glaſs alters its colour much ſooner than the water in the bubble, which is ſurrounded with air: for in the water, when viewed obliquely, the ſame colour might be ſeen at more than twelve times the thickneſs it appeared at under a direct view; but when the air was viewed under ſuch an obliquity, that the thickneſs of the plate, where it was obſerved, was but half as much again as when it was viewed directly, a different colour appeared.

Laſtly, the ſame colour reflected from a denſer ſubſtance reduced to a thin plate, and ſurrounded by a rarer, will be more briſk than the ſame colour, when reflected from a thin plate formed of the rarer ſubſtance, and ſurrounded by the denſer; as was found by blowing glaſs very thin, which exhibited in the open air more vivid colours than the air does between two glaſſes.

As to the thickneſs of the plate of air by which the ſeveral colours were reflected, it was found by carefully meaſuring the diſtances of the rings from the points where the glaſs is touched, that the diſtance between the glaſſes where the firſt order of colours was reflected, was from $\frac{1}{178000}$ to $\frac{2}{178000}$ part of an inch; that where the ſecond, was from $\frac{3}{178000}$ to $\frac{4}{178000}$; that where the third, from $\frac{5}{178000}$ to $\frac{6}{178000}$, and ſo in a ſeries of the odd numbers: and that the diſtance of the glaſſes, where the firſt order of colours that was tranſmitted paſſed through, was from 0 to $\frac{1}{178000}$ part of an inch; that where the ſecond, was from $\frac{2}{178000}$ to $\frac{3}{178000}$; that where the third, from $\frac{4}{178000}$ to $\frac{5}{178000}$, and ſo on in a ſeries of the even numbers. And the thickneſs of a plate of water, where it reflected or tranſmitted the ſame colours, was $\frac{3}{4}$ of the thickneſs of the plate of air.

Now we learn from experiments made with the microſcope, that the leaſt parts of almoſt all bodies are tranſparent; or the ſame may be experienced in the following manner: Take a very thin plate of the opaqueſt body, and the room being darkened, apply it to a ſmall hole in the window-ſhutter, and it will ſufficiently diſcover its tranſparency. This experiment cannot be ſo well performed with a white body, becauſe of the ſtrong reflecting power in ſuch; but even thoſe, when diſſolved in aqua-fortis or other proper menſtruums, do alſo become tranſparent. Wherefore if we ſhould ſuppoſe any body reduced to a thinneſs proper to produce any particular colour, and then broken into fragments, in all probability each fragment would exhibit that colour, and a heap of ſuch fragments would conſtitute a body of that colour; ſo that the cauſe, why ſome bodies reflect one ſort of rays moſt copiouſly, and ſome another, is probably no other than the different magnitude of their conſtituent particles.

This Sir Iſaac Newton thinks a probable ground for making conjectures concerning the magnitude of the conſtituent particles of bodies. The green of vegetables he takes to be of the third order, as likewiſe the blue of the ſyrup of violets. The azure colour of the ſky he thinks is of the firſt order, as alſo the moſt intenſe luminous white; but if it is leſs ſtrong, he then conjectures it to be a mixture of the colours of all the orders. Of the latter ſort he takes the colour of linen, paper, and ſuch like ſubſtances to be; but white metals to be of the former ſort. For producing black the particles muſt be ſmaller than for exhibiting any of the colours, viz. of a ſize anſwering to the thickneſs of the bubble where it reflected little or no light, and for that reaſon appeared colourleſs.

The colours in the ſame part of a peacock's tail vary as the tail changes its poſture with reſpect to the eye; juſt ſo the thin plates of air or water appear of a different colour in the ſame plate when viewed directly, from what they do when ſeen obliquely,

as was obſerved above. The colours of ſilks, cloths, and other ſubſtances, which water or oil can intimately penetrate, become faint and dull by being wet with ſuch fluids, and recover their brightneſs when dry; juſt as we obſerved that plates of Muſcovy glaſs grow faint and dim by wetting: all which particulars, and many more that might be produced, abundantly prove the preſent propoſition.

COLOUR, in painting, is applied both to the drugs made uſe of in that art, and to the teints produced by thoſe drugs variouſly mixed and applied.

Colours may be either pigments or fluids. By pigments is meant all ſuch ſolid bodies as require to be mixed with ſome fluid, as a vehicle, before they can be uſed as paints, except in the caſe of crayons, where they are uſed dry. Theſe make the far greater part of the whole; the fluid colours being only a ſmall number employed along with water colours; and aſphaltum, which is ſometimes employed in oil-painting.

Colours are diſtinguiſhed into ſeveral kinds, according to the vehicles in which they are worked, as oil-colours, water-colours, enamel-colours, &c. The ſame ſorts of pigments, however, are, in many inſtances, employed in more than one kind of painting, as vermilion and lake in ſeveral, and ultramarine in all.

The principal qualities in colours, conſidered with regard to their perfection or faultineſs, are two; purity of colour, and durableneſs: purity of colour is, by the painters, called *brightneſs*, and the defect of it *foulneſs*, or ſometimes the breaking the colour: durableneſs is called *ſtanding*, and the negative, or want of it, *flying*, or flying off; which terms, for conciſeneſs, we ſhall uſe in ſpeaking of theſe qualities.

Brightneſs and ſtanding well are the only properties which are neceſſary to the perfection of every kind of colours, and they equally relate to all; but there are others which are eſſential to many ſorts, with regard only to particular purpoſes and uſes.

The moſt conſiderable of the more general properties of colours, after purity and durableneſs, or brightneſs and ſtanding well, are tranſparency and opacity; for according to their condition, with reſpect to theſe qualities, they are fitted to anſwer very different kinds of purpoſes. Colours which become tranſparent in oil, ſuch as lake, Pruſſian blue, and brown pink, are frequently uſed without the admixture of white, or any other opaque pigment; by which means the teint of the ground on which they are laid retains, in ſome degree, its force; and the real colour produced in the painting is the combined effects of both. This is called glazing, and the pigments endued with ſuch property of becoming tranſparent in oil, are called glazing colours. The ſame holds good alſo of ſuch colours as are tranſparent in water; only when they are there uſed in this manner, they are not called glazing, but waſhing, colours. When colours have no degree of ſuch tranſparency in the vehicle in which they are uſed, as vermilion, king's yellow, and ſeveral others, they are ſaid to have a body, and to cover. The property of glazing or waſhing is of ſo much importance, both in oil and water, that no other method can equally well produce the ſame effect in many caſes, either with regard to the force, beauty, or ſoftneſs of the colouring; and it is therefore very eſſential to the perfection of ſeveral kinds of pigments, that they ſhould poſſeſs this property in a complete degree; but, in other inſtances, the uſing colours with a ſtrong body is not leſs neceſſary, eſpecially for the grounding or laying in, as it is called, of many objects to be painted.

There is another material quality in colours, that relates only to their uſe in oil, which is the drying well, and, as it is called, not fatſening. By fattening is meant a coagulation of the oil, that frequently happens on its commixture with ſeveral kinds of pigments, by the effect they have upon it; from whence, after ſome time keeping, it is rendered of ſo viſcid or glutinous a conſiſtence, as to be wholly incapable of being worked with either bruſh or pencil. This quality, when found in them, deſtroys almoſt wholly the value of ſuch pigments for the purpoſes of the colourmen, who ſell a great part of them ground in oil, and tied up in pieces of bladder, where they are kept till there is a demand for them, which frequently does not happen ſoon; and, therefore, gives time for their ſpoiling, in conſequence of this quality. But to painters who mix the colours for themſelves on their pallets with the oil, this property is not an equal inconvenience, when in a leſſer degree; only, in general, it muſt be obſerved, that colours, in proportion to their tendency to fatten, are ſlow in drying; and when the oil once contracts this ſtate, it will be a very long time before it will become duly hard and firm in the painting.

There are two other qualities of colour in general that relate only to their teint, or hue; but which render them, nevertheleſs, fit or improper, in a very material degree, for different purpoſes. They are diſtinguiſhed by the names of *warmth* and *coolneſs*; terms which, indeed, are uſed very frequently by painters, but, for the moſt part, very indefinitely, and without any preciſe or clear meaning. What is meant, when properly uſed, by warmth, is that fiery effect which a ſmall addition of yellow gives to a true red, and that glowing appearance which red imparts to either yellow or blue. By warmth, therefore, in red, is to be underſtood a ſmall inclination towards orange; by the ſame term applied to yellow, a like tendency by the admixture of red; and by the ſame again, in the

caſe of blue, muſt be underſtood its ſlightly verging on the purple.

By coolneſs is to be underſtood the oppoſite to warmth; but this term is ſeldom uſed, except in ſpeaking of yellow and blue; and there it means either the negation of that which cauſes warmth, or a tendency to green, in either colour, by a ſlight admixture of the other.

The ſenſe of the word warmth, when applied to colouring, or the combined appearance of various teints, muſt not be confounded with that which it has when ſpeaking of particular colours; for there it relates to the producing a ſtrong effect by the diſpoſition or contraſt of the colours, or the groſſneſs of the teints, and not the qualities peculiar to, or inherent in, the colours themſelves.

The colours uſed in all the ſeveral kinds of painting, except ſome peculiar to enamel, are as follows:

Claſs I. Red—Vermilion, native cinnabar, red lead, ſcarlet oker, common Indian red, Spaniſh brown, terra de Sienna burnt; theſe are ſcarlet, or tending to the orange. Carmine, lake, roſe-pink, red oker, Venetian red; theſe tend to the crimſon, or to the purple.

Claſs II. Blue—Ultramarine, ultramarine aſhes, Pruſſian blue, verditer, cendre blue, or ſanders blue, indigo, ſmalt, bice, litmus, or lacmus.

Claſs III. Yellow—King's yellow, Naples yellow, yellow oker, Dutch pink, Engliſh pink, light pink, gamboge, meſticot, common orpiment, gall-ſtone, terra de Sienna unburnt, turpith mineral, yellow berry waſh, turmeric waſh, tincture of ſaffron.

Claſs IV. Green——Verdigriſe, diſtilled verdigriſe, or cryſtals of verdigriſe, Pruſſian green, terra vert, ſap green.

Claſs V. Orange——Orange lake.

Claſs VI. Purple——True Indian red, archal, logwood waſh.

Claſs VII. Brown—Brown pink, biſtre, brown oker, umbre, Cologne earth, aſphaltum, Spaniſh juice, or extract of liquorice.

Claſs VIII. White——White flake, white lead, calcined hartſhorn, pearl white, troy-white, egg-ſhell white.

Claſs IX. Black——Lamp black, ivory black, blue black, Indian ink. See each under its proper article.

Theſe are all the colours at preſent in uſe in this country, in any kind of painting, except ſuch as are peculiar to enamel; in which kind of painting, as but few of theſe are capable of combining with glaſs, and enduring the neceſſary heat without changing their nature, or being deſtroyed, others are employed more ſuitable to vitrification: for which ſee the article ENAMEL *Painting*.

Theory of mixing of COLOURS. There are two things to be principally conſidered in regard to colours; namely, the hue, (which is properly what may called the colour) and the ſtrength of light and ſhadow: for as different colours, ſuppoſe red and green, may have the ſame ſtrength of light, ſo two things, that are one of them much darker than the other, may ſtill have the ſame hue as a light blue and a dark blue.

With reſpect to the hue, theſe two things are to be conſidered. 1°. The ſpecies of colour, and 2°. The perfection and imperfection of colour under the ſame ſpecies differ in degrees of perfection, as the red of a field poppy is much more perfect than the red of a brick. This quality of perfection and imperfection in the colours, by the painters, is expreſſed by the terms bright, or clean or ſimple, and broken, which is taken from their method of making the imperfect colours by the mixture of other colours, which is called breaking the colours. With reſpect to this quality of colours, Sir Iſaac Newton, in his Treatiſe on Optics, ſhews that every ray of light has its proper colour, which it always carries with it, and never loſes, in whatever manner it happens to be reflected or refracted. Theſe natural colours of the rays are the bright ſimple colours, and the natural order of them, as they appear when they are ſeparated by the refraction of a priſm, is red, orange, yellow, green, blue, indico, violet: all the leſs perfect or broken colours are made by the compoſition and mixture of theſe ſimple colours, as yellow rays mixed with blue rays make a green, but not ſo perfect as the ſimple natural rays that are green; and red and yellow rays make an orange colour, but not ſo perfect as the natural orange-coloured rays. And by a juſt proportion of all the natural rays together, is produced whiteneſs, which is indifferent to all the ſimple colours, and cannot be ſaid to incline more to one colour than to another. By white is to be underſtood any colour between the lighteſt white and the darkeſt black; for as we are not now conſidering the degrees of light and ſhade, all the colours from black to white are to be conſidered as of the ſame hue.

According to this obſervation of the nature of whiteneſs, it appears that the broken colours are a medium between the ſimple colours and white; and the more broken a colour is, the nearer it is to white, and the further it is from white, the more ſimple it is.

Having thus explained the nature of the colours, and the effect of their mixture, in order to find exactly what colour will be produced by the mixture of any colours given, the colours are to be diſpoſed in the following manner. Let there be a circle, as A D F A (Plate XXXV. *fig.* 7.) deſcribed, and let the circumference be divided into ſeven parts AB, BC, CD, DE, EF, FG, GA, in the ſame proportion to one another as the fractions $\frac{1}{9}$, $\frac{1}{18}$, $\frac{1}{16}$, $\frac{1}{9}$, $\frac{1}{16}$, $\frac{1}{18}$, $\frac{1}{9}$; which are the

proportions of the musical notes *Sol*, *la*, *fa*, *sol*, *la*, *mi*, *fa*, *sol*. Between A and B place all the kinds of red, from B to C place all the kinds of orange, from C to D place all the kinds of yellow, from D to E place all the kinds of green, from E to F place all the kinds of blue, from F to G place all the kinds of indico, and from G to A place all the kinds of violet. Having thus disposed the simple colours, the center of the circle O will be the place of white. And between the center and the circumference are the places of all the broken compounded colours, those nearest the center being the most compounded, and those farthest from it being the least compounded: as in the line O 1, all the colours at 1, 2, 3, 4, are of the same species; that is, green inclining toward blue; but the colour at 1 is the simple natural colour; that at 2 is something compounded, or broken; that at 3 is more broken; and that at 4 is still more broken.

The colours being thus disposed, to know what colour results from the mixture of any colours given, find the center of gravity of the places of the colours given, and that will shew the character of the compound. For example, suppose it were required to know what colour would result from the mixture of two parts of the simple yellow at P, with three parts of the simple blue at Q; first find the center of gravity 3 of the points P and Q thus: draw P Q, and having divided it into five parts, (which is the sum of three and two) take the point 3 three parts from P, (because there are three parts of blue) and two parts from Q (because there are two parts of the colour at P); then draw O 3 cutting the circumference in 1, by the place of the point 1, (which is between D and E, but nearer to E) we find the mixture is a green inclining towards blue; but because 3 is near the middle between the center and the circumference, the colour is pretty much broken. To make the same thing more clear by another example; suppose I would know what would result from a mixture of two parts yellow at P, three parts blue at Q, and five parts red at R. First I find the place 3 of the mixture of the yellow and the blue, as before; then drawing the line 3 R (because there are five parts of the colour at 3, and five parts of the colour at R) I divide it into ten parts, and take the point *r* five parts distant from R. By this means *r* is the center of gravity of the three colours at P, Q, and R, and is consequently the place of the mixture; which by drawing O *r* cutting the circumference in *s*, I find to be an orange a little inclining towards red; and because *r* is much nearer the center than the circumference, the colour is very much broken: and thus one may proceed in other cases.

Again, having given the place of any compound colour, one may find what colours may be mixed to compound it. Thus, having given the colour at 3, drawing any line P 3 Q through 3, the colour proposed may be made by a mixture of the colours in P and Q, taking such a proportion of them as is expressed by the lines 3 P and 3 Q; that is, taking of the colour P as much as in proportion to 3 Q, and as much of the colour Q as is in proportion to 3 P; or having drawn O 3 passing through the points 1, 2, 4, the same colour may be produced by mixing the colours in 2 and 4, in proportion to the lines 4, 3, and 2, 3; or it may be produced by breaking the simple colour at 1, with white (which is at O) in the proportion of the lines 3, 1, and 3 O: and thus in other cases.

The proportions hitherto mentioned of the colours to be used in the mixtures, relate to the quantity of the rays of light, and not to the materials which artificial colours are made of. Wherefore if several atificial colours were to be mixed according to these rules, and some of them are darker than others, there must be a greater proportion used of the darker materials, to produce the hue proposed, because they reflect fewer rays of light in proportion to their quantities; and a lesser proportion must be used of the lighter materials, because they reflect a greater quantity of light.

If the nature of the material colours, which are used in painting, was so perfectly known, as that one could tell exactly what species of colour, how perfect, and what degree of light and shade each material has with respect to its quantity, by these rules one might exactly produce any colour proposed, by mixing the several materials in their just proportions. But though these particulars cannot be known to sufficient exactness for this purpose, besides the tediousness that would be in practice, to measure the colours according to their exact proportions; yet the knowledge of this theory may be of great use in painting. Suppose, for example, I had a pallet provided with the several colours at *a*, *b*, *c*, *d*, *e*; suppose for instance at *a*, carmine; at *b*, orpiment; at *c*, pink; at *d*, ultramarine; at *e*, smalts; and I had occasion to make a broken green, such as I judge should be placed at *x*. I see that it does not lie a great deal out of a line drawn through *c* and *d*; therefore I conclude, that mixing the colours *c* and *d* will come very near to what I want: but because *x* is nearer to the center O than the line *c d*, having brought my tint as near as I can to what I want, suppose to *z*, I look from *z* cross *x* for some colour opposite to *z*, to break the tint with, and I find the nearest to be *a*; therefore by mixing of the colour *a*, I bring the composition to the tint I have occasion for. If the colour *a* carries the tint too much towards the line O D, I put a little more of the colour *d*, which brings it into the right place: or having got the tint *z*, I might have broken it with white, whose place is at the center O: or putting a greater proportion of the colour *d*, instead of *a*, I may afterwards break the tint by means of the colour *b*. And in the same manner,

by

by only inſpecting this ſcheme, one may ſee in what manner to make any tints whatſoever that can be produced by the colours that one uſes. Thus one ſees that red and yellow make a brown orange colour, which may ſtill be more broken by adding blue, or indico, or violet, which are to be taken one or other, as one would have the tint inclined more to the yellow or to the red, blue bringing it towards the yellow, and breaking it too much, and violet carrying it towards the red, and not breaking it ſo much.

From theſe principles one may ſee the reaſon why the materials of the brighteſt and ſimpleſt colours are the moſt valuable, and of them why the lighteſt are moſt to be eſteemed. The ſimpleſt colours are the moſt valuable, becauſe they cannot be produced by mixture; for mixture always breaks the colours: ſuppoſe *a*, *b*, *c*, *d*, *e*, to be all the colours you have, then drawing lines to join the points *a*, *b*, *c*, *d*, *e*, all the tints that can be produced by thoſe colours will have their places within the area of the polygon *a*, *b*, *c*, *d*, *e*. That the lighter colours are more valuable than the dark ones, is becauſe black does not break the colours ſo much as white; ſo that it is eaſier to make the clean dark tints with light colours and black, than to make the bright light ones with dark colours and white: for, by what has been ſhewed, white breaks the colours very much, but black, being nothing but the abſence of light, only darkens the colours; though upon account of the imperfection of the materials that are in uſe, black does alſo break the colours ſomething, becauſe there is no material ſo perfectly black as to have no colour at all, as one ſees by the beſt blacks having lights and ſhades. There will be other exceptions alſo to be made in the application of theſe obſervations to practice, upon account of the particular qualities of the materials ſome colours are made of. If all the colours were as dry powders, which have no effect upon one another, when mixed, theſe obſervations would exactly take place in the mixing of them: but ſome colours are of ſuch a nature, that they produce a very different effect upon the mixture, to what one would expect from theſe principles: ſo that it is poſſible there may be ſome darker materials, which, when diluted with white, may produce cleaner and leſs compounded colours than they gave when ſingle; as ſome colours do very well to glaze with, which do not look well when laid on in a body.

COLOUR, in heraldry. The colours generally uſed in heraldry are red, blue, black, green, and purple, which heralds call gules, azure, ſable, vert, or ſinople, and purpure. Tenne, or tawny, and ſanguine, are not ſo common. As to yellow and white, called or and argent; they are metals, not colours. Theſe metals and colours are ſometimes alſo expreſſed in blazon by the names of precious ſtones, and ſometimes by thoſe of planets, or ſtars.

Œnomaus is ſaid to have firſt invented the diſtinction of colours, to diſtinguiſh the gundillæ of combatants of the Circenſian games: the green for thoſe who repreſented the earth; and the blue for thoſe who repreſented the ſea.

COLOUR, in law, is a probable or plauſible plea, though really falſe in itſelf, and only calculated to draw the trial of the cauſe from the jury to the judge.

COLOURING, among painters, the manner of applying and conducting the colours of a picture; or the mixtures of light and ſhadows formed by the various colours employed in painting.

The colouring is one of the chief branches in painting, which art is, by Mr. Felibien, divided into three parts, the deſign, the compoſition, and the colouring. See the article PAINTING.

COLOURING *and non-colouring Drugs.* Into theſe dyers diſtinguiſh their ingredients: the firſt are applicative, and communicate their colours to the matters boiled in them, or paſſed through them, as woad, ſcarlet-grain, cochineal, indigo, madder, turmeric, &c.

The ſecond ſerve to prepare and diſpoſe the ſtuffs and other matters, and to extract the colour out of the colouring ingredients; as alum, ſalt or cryſtal of tartar, arſenic, realgal, ſalt-petre, common ſalt, ſal ammoniac, ſal gemmæ, agaric, ſpirit of wine, bran, peas-flour, wheat, ſtarch, lime, and aſhes.

COLOURS, in the marine, certain banners or ſtreamers which diſtinguiſh the ſhips or fleets of one nation from thoſe of another; and the inferior diviſions or ſquadrons of a fleet from each other. See the article FLAG.

A ſuit of colours for the admiral's ſhip conſiſts of a flag, enſign, and jack; and thoſe of a commodore or private ſhip of war with the two latter and a pendant. See the articles ENSIGN, JACK, and PENDANT.

COLOURS *uſed in Dying.* There are in the art of dying five colours, called ſimple, primary, or mother colours, from the mixture of which all other colours are formed; theſe are blue, red, yellow, brown, and black. Of theſe colours, variouſly mixed and combined, they form the following colours, panſy, blue, and red; from the mixture of blue and ſcarlet are formed amaranth, violet, and panſy; from the ſame mixture of blue, crimſon, and red, are formed the columbine or dove colour, purple, crimſon, amaranth, panſy, and crimſon violet.

Here it is to be obſerved, that they give the name crimſon to all colours made of cochineal.

Of blue and red madder is dyed purple, pepper colour, tan colour, and dry-roſe colour.

The ſame blue, with red, half in grain, makes amaranth, tan colour, and dry-roſe colour.

Blue and half-red crimſon compoſe amaranth, tan colour, dry-roſe, a brown panſy, and ſun-brown.

Blue

Blue and yellow mixed together compoſe a yellow-green, ſpring-green, graſs-green, laurel-green, brown-green, dark-green; as well as ſea-green, parrot-green, cabbage-green, &c. theſe three laſt colours are to be leſs boiled than the reſt.

This is to be noted, that as to green there is no ingredient or drug in nature that will dye it, but the ſtuffs are dyed twice, firſt in blue, then in yellow.

Blue and brown. Theſe two colours are never mixed alone; but with the addition of red, either of madder or cochineal, they form ſeveral colours.

Red and yellow. All the ſhades compoſed of theſe two colours, as gold-yellow, aurora, marygold, orange, nacarat, granat-flower, flame colour, &c. are made with yellow and red of madder; ſcarlet being leſs proper as well as too dear.

Red and brown. Of theſe two colours are formed cinnamon colour, cheſnut, muſk, bears-hair, and even purple, if the red be that of madder.

Yellow and brown. The colours formed from theſe two are all the ſhades of feuille-mort and hair colours.

But this may be taken notice of, that though it be ſaid that there are no colours or ſhades made from ſuch and ſuch mixtures, it is not meant that none can be made, but that they are more eaſily formed from a mixture of other colours.

COLT, in zoology, the ſame with foal, being the young of the horſe-kind. See FOAL.

COLT-EVIL, among farriers, a ſwelling of the yard and cods, incident both to ſtoned horſes and geldings; for which, after waſhing the part with luke-warm vinegar, it is uſual to anoint them with juice of rue, mixed with honey, and boiled in hog's greaſe, adding bay-leaves and the powder of fenugreek.

COLT'S FOOT, in botany, the Engliſh name of the tuſſilago. See TUSSILAGO.

COLTIE, a term uſed by timber-merchants for a defect, or blemiſh, in ſome of the annular circles of a tree, whereby its value is much diminiſhed.

COLUBRINUM LIGNUM, ſnake-wood. See NUX VOMICA.

COLUMBINE, *Aquilegia*, in botany. See the article AQUILEGIA.

COLUMBINE-*Colour*, or dove-colour, among painters, denotes a kind of violet.

COLUMBUS, or *Congregation of St.* COLUMBUS, a ſociety of regular canons, who formerly had an hundred abbies or monaſteries in the Britiſh iſlands.

COLUMN, in architecture, a round pillar, made to ſupport and adorn a building, and compoſed of a baſe, a ſhaft, and a capital. As every fulcrum is ſo much the more perfect, as it is firm, or carries the appearance of firmneſs; hence all columns ought to have their baſe broader than themſelves. See the article BASE.

And as a cylinder and a quadrangular priſm are more eaſily removed out of their place than a truncated cone, or a pyramid on the ſame baſe, and of the ſame altitude, the figure of columns ought not to be cylindrical, but grow leſs and leſs, like a truncated cone. Again, as columns are more firm if their diameter bears a greater proportion to their height than if it bore a leſs, the greater ratio is to be choſen where a large weight is to be ſuſtained; and leſs, where a ſmall weight is to be ſupported. Further, as the deſign of a column is to ſupport a weight, it muſt never be ſuppoſed without an entablature.

Columns are different in the different orders of architecture, and may be conſidered with regard to their matter, conſtruction, form, diſpoſition, and uſe. With reſpect to the order, we have

Tuſcan COLUMN, that which has ſeven diameters in height, and is the ſhorteſt and moſt ſimple of all the columns.

Its diminution is one fourth; that is, the diameter at top is three fourths of the diameter juſt above the baſe.

Doric COLUMN has eight diameters in height, and its capital and baſe more enriched with mouldings than the Tuſcan. It diminiſhes one fifth part of the diameter at the baſe.

Ionic COLUMN has nine diameters in height, and differs from the others by the volutes in its capital, and by its baſe.

Corinthian COLUMN, the richeſt and moſt delicate of all, has ten diameters in height, and its capital adorned with two rows of leaves with caulicoles, from whence ſpring ſmall volutes. It diminiſhes one ſeventh part of the diameter.

Compoſite COLUMN has likewiſe ten diameters in height, and two rows of leaves in its capital, with angular volutes like the Ionic. It diminiſhes one eighth part of the diameter of the baſe.

It may be obſerved, that different authors give different heights and proportions to columns of the ſame order, and that frequently the ſame author takes the liberty of diſpenſing with his own rules; but the heights and proportions exhibited above are a mean between the extremes of all the reſt.

COLUMNS *with regard to their Matter*, are:

Fuſible COLUMN comprehends not only columns of various metals, and other fuſible matter, as glaſs, &c. but alſo thoſe of ſtone, ſaid to be caſt, the ſecret of which ſome believe to have been known to the ancients.

Hydraulic COLUMN, the whole ſhafts appear to be of cryſtal; being formed by a number of little threads of water, falling from holes made in a girt of metal, at equal diſtances, by means of a pipe mounting through the middle of it. It alſo denotes a column from whoſe top proceeds a jet d'eau, to which the capital ſerves as a baſon, whence the water deſcends by a little pipe, which turns ſpirally round the ſhaft.

Moulded COLUMN, that made by impaſtation of gravel and flints of divers colours, bound together with a cement.

Water COLUMN, that whoſe ſhaft is formed of a large jet d'eau, which ſpouting out water violently from the baſe, drives it within the tambour of the capital, which is hollow, and in falling down it reſembles a column of liquid cryſtal.

COLUMNS, *with regard to their Conſtruction.*

Cabled or *Rudented* COLUMN, that having projectures in form of cables, in the naked of the ſhaft, each cable having an effect oppoſite to that of a fluting, and accompanied with a little liſt on each ſide.

Coloſſal COLUMN, one of ſo large a ſize as not to enter any ordinance of architecture, but deſigned to be placed ſolitary in the middle of a ſquare, &c. Such is the Trajan column.

Corollotic COLUMN, that adorned with foliages, turned ſpirally round the ſhaft, or in form of crowns and feſtoons: they are very proper for decorations of theatres.

Diminiſhed COLUMN, that which has no ſwelling, but begins to taper from the baſe, in imitation of trees.

Geminated COLUMN, that whoſe ſhaft is formed of three ſimilar and equal ſides or ribs of ſtone, fitted within one another, and faſtened at bottom with iron pins, and at top with cramp-irons: it ought to be fluted, that the joints may be leſs diſcernible.

COLUMN *of Joinery*, that made of ſtrong timber-boards joined together: it is hollow, turned in the lathe, and uſually fluted: ſuch are the columns of moſt altar-pieces.

COLUMN *of Maſonry* is made of rough ſtone, well laid and covered with plaſter; or of bricks, laid triangular-wiſe, and covered with ſtucco.

COLUMN *of Tambours*, or *Bands*, that whoſe ſhaft is formed of ſeveral courſes of ſtone, or blocks of marble, leſs high than the diameter of the column.

COLUMN *in Truncheons*, or *Pieces*, conſiſts of two, three, or four pieces of ſtone or metal, differing from the tambours, as being higher than the diameter of the column.

COLUMNS *with regard to their Form*, are:

Fluted COLUMNS, called alſo channelled and ſtraited columns, thoſe whoſe ſhafts are adorned with flutes or channellings, either from top to bottom, or only two thirds of their height.

Gothic COLUMN, a round pillar, either too ſhort for its bulk, or too ſlender for its height, having ſometimes twenty diameters, without either diminution or ſwelling, conſequently differing widely from the proportions of the antique.

Hermetic COLUMN, a kind of pilaſter, in manner of a terme, having the head of a man in lieu of a capital. It is ſo called becauſe the ancients placed on the top of ſuch columns the head of Mercury.

Maſſive COLUMN, one too ſhort for the order, the capital of which it bears: it likewiſe comprehends Tuſcan and Ruſtic columns.

Oval COLUMN, that whoſe ſhaft has a flatneſs, its plan being made oval, to reduce the projecture.

Paſtoral COLUMN, that whoſe ſhaft is formed in imitation of a trunk of a tree, with bark and knots. It may be uſed in the gates of parks and gardens, and in the decoration of paſtoral ſcenes.

Serpentine COLUMN, that formed of three ſerpents twiſted together, the heads of which ſerve as a capital: it is now called the taliſman, or enchanted column.

Swelled COLUMN, that which has a bulging in proportion to the height of the ſhaft. This practice obtains among the modern architects, but ſeems to have been unknown to the ancients.

Twiſted COLUMN, that whoſe ſhaft is twiſted round in form of a ſcrew, with ſix circumvolutions, being ordinarily of the Corinthian order. Sometimes the twiſted column is in form of two or three ſlender ſhafts twiſted round, ſo as to leave a cavity in the middle.

COLUMNS, *with regard to their Diſpoſition.*

Angular COLUMN is an inſulted one, placed in the corner of a portico, or inſerted in the corner of a building, or even a column that flanks any angle of a polygon.

Attic COLUMN, according to Pliny, is an inſulated pilaſter, having four equal faces, and of the higheſt proportion.

Cantoned COLUMNS are thoſe engraved in the four corners of a ſquare pillar, to ſupport four ſprings of an arch.

Coupled COLUMNS, thoſe diſpoſed two and two, ſo as almoſt to touch each other at their baſes and capitals.

Doubled COLUMN, one column joined with another in ſuch a manner that the two ſhafts penetrate each other with a third of their diameter.

Engaged COLUMN, that which enters in a wall with one third or one fourth of its diameter.

Grouped COLUMNS, thoſe placed on the ſame pedeſtal or ſocle, either by three and three, or four and four.

Inſulated COLUMN, one ſtanding free and detached from every other body.

Medium COLUMNS, a name given by Vitruvius to the two columns in the middle of a porch, which have their intercolumniation larger than the reſt. The term may alſo be applied to the middle row of columns in a frontiſpiece adorned with three orders.

Niched COLUMN, that whoſe ſhaft enters with half its diameter into a wall, hollowed out for its reception.

reception with its plane parallel to the projecture of the tore.

COLUMNS, *with regard to their Use*, are either, 1ſt. Aſtronomical columns, ſuch as that at Paris, erected for aſtronomical obſervations. 2. Chronological column. 3. Funeral column, which generally bears an urn, and has its ſhaft overſpread with ſymbols of grief and of immortality. 4. Gnomonic column, a cylinder, upon which the hour of the day is repreſented by the ſhadow of a ſtyle: of theſe there are two kinds; in the one the ſtile is fixed, and the hour-lines are no more than the projection of a vertical dial upon a cylindrical ſurface: in the other the ſtyle is moveable, and the hour-lines are drawn to the different heights of the ſun in the different ſeaſons of the year. 5. Hiſtorical column, that whoſe ſhaft is adorned with a baſſo relievo, running in a ſpiral line its whole height, and containing the hiſtory of ſome great perſonage. 6. Hollow column, that which has a ſpiral ſtair-caſe within-ſide, for the conveniency of aſcending to the top. 7. Indicative column, that which ſerves to ſhew the tides along the ſea-coaſts. 8. Inſtructive column, that which conveys ſome precept or inſtruction, ſuch as that raiſed by the ſon of Piſiſtratus at Athens, containing the rules of agriculture. 9. Itinerary column, one with ſeveral faces, placed in the croſſing of ſeveral roads, ſerving to ſhew the different routes by the inſcriptions engraved on its ſeveral faces. 10. Lactary column, at Rome, a column, according to Feſtus, in the herb-market, in the pedeſtal of which was a cavity, wherein young children, abandoned by their parents, through poverty or inhumanity, were expoſed to be educated at the expence of the public. 11. Legal column, among the Lacedemonians, that erected in a public place, upon which were engraven the fundamental laws of the ſtate. 12. Limitrophous, or boundary column, that which ſhews the limits of a kingdom, or country, conquered. Thoſe called the Columns, or Pillars of Hercules, are two very ſteep mountains, in the Streights of Gibraltar. 13. Luminous column, one formed in a cylindrical frame, mounted and covered over with oiled paper or gauze, ſo that lights being diſpoſed in ranks within over each other, the whole appears to be on fire. 14. Manubiary column, a column adorned with trophies, built in imitation of trees, whereon the ſpoils of enemies were anciently hung. 15. Memorial column, that raiſed on occaſion of any remarkable event, as the Monument in London, built to perpetuate the memory of the burning of that city in 1666. 16. Menian column, any column that ſupports a balcony, or meniana. 17. Miliary column, a column of marble, raiſed, by order of Auguſtus, in the middle of the Roman forum, from whence, as a center, the diſtances of the ſeveral cities of the empire were reckoned by other miliary columns, diſpoſed at equal diſtances on all the grand roads. 18. Roſtral column, that adorned with the beaks, or prows of ſhips, &c. erected either in memory of a naval victory, or in honour of ſome admiral, &c. 19. Statuary column, that which ſupports a ſtatue. 20. Symbolical column, that repreſenting by ſymbols ſome particular country, or ſome memorable action. 21. Triumphal column, that erected by the antients in honour of an hero; the joints of the ſtones or courſes of which were covered with as many crowns as he had made military expeditions. 22. Zoophoric column, a kind of ſtatuary column, bearing the figure of ſome animal.

Scenography of a COLUMN. See the article SCENOGRAPHY.

COLUMN, among printers, is half a page, when the page is divided into two parts from top to bottom.

COLUMN, in the military art, a long deep file of troops or baggage.

The firſt and ſecond lines of an army, as they are encamped, make generally two columns on a march, filing off either to the right or left: ſometimes the army marches in four, ſix, or eight columns, according as the ground will allow; and each column is led by a general officer.

COLUMNS of a fleet or ſquadron. See the article LINES, SAILING.

COLUMNA, in anatomy, a term applied to different parts: thus the *columna naſi* is the loweſt and fleſhy part of the noſe, which forms a part of the ſeptum; and the *columna oris* is the ſame with the uvula. See SEPTUM and UVULA.

The columnæ cordis are ſmall, long, and round fleſhy productions in the ventricles of the heart. See HEART.

COLUMNEA, in botany, a plant with a climbing ſtalk, the leaves are oval, ſerrated on their edges, and ſtand upon ſhort foot-ſtalks; theſe, as alſo the ſtalks are very hairy. The flower is monopetalous and ringent, with four ſtamina, two being longer than the others. The fruit is an ovated biocular capſule, containing a number of ſmall, oblong ſeeds.

This plant, being a native of the warmeſt parts of America, requires a hot-houſe in this climate for their preſervation.

COLURES, in aſtronomy and geography, two great circles ſuppoſed to interſect each other at right angles, in the poles of the world, and to paſs through the ſolſtitial and equinoctial points of the ecliptic.

That which paſſes through the two equinoctial points is called the equinoctial colure, and determines the equinoxes; and the other, which paſſes through the poles of the ecliptic, is called the ſolſtitial colure, becauſe it determines the ſolſtices. See EQUINOX and SOLSTICE.

COLUTEA, bladder-ſena, in botany, a genus of plants producing papilionaceous flowers. The

common ſort is a ſhrub, which grows naturally in Auſtria, in the ſouth of France and Italy, from whence the ſeeds were originally brought to England. This plant hath ſeveral woody ſtems, which grow to the height of ten or twelve feet, ſending out many branches, which are furniſhed with winged leaves, compoſed of four or five pair of oval leaves placed oppoſite, and terminated with an odd one; theſe are indented at the top, and are of a grayiſh colour. The flowers come out from the wings of the leaves on ſlender foot-ſtalks, about two inches long; each ſuſtaining two or three flowers of the butterfly kind; theſe are yellow, with a dark coloured mark on each petal; they are ſucceeded by inflated pods an inch and a half long, having a ſeam on the upper ſide, containing a ſingle row of kidney-ſhaped ſeeds.

This flowers in June or July, and the ſeeds ripen in autumn; they are propagated by ſeeds, and are very common in ſhrubberies, &c.

COMA, or COMA-VIGIL, a preternatural propenſity to ſleep, when, nevertheleſs, the patient does not ſleep, or, if he does, awakes immediately, without any relief. This diſorder is always ſymptomatic, and often attends acute, burning, and malignant fevers; as alſo an inflammation of the dura mater, and uſhers in a phrenzy. Sometimes it attends a hemiplegia.

For the cure of the coma-vigil, if the fever has not continued above the third or fourth day, it is expedient to take away a large quantity of blood; then the body, if coſtive, muſt be opened with clyſters, which muſt not be very acrid; afterwards diluters and refrigerants ſhould be given to moderate the febrile heat, ſuch as abſorbent powders, gentle nitrous medicines, taken in a draught with diaphoretic antimony, &c.

COMARUM, marſh cinquefoil, in botany, a plant whoſe flower conſiſts of five oblong, acuminated petals, three times leſs than the cup in which they are inſerted, with twenty ſubulated, permanent filaments, topped with lunular, deciduous antheræ; it has no pericarpium, but a ſcrotiform, fleſhy receptacle, which is large and perſiſtent, and contains numerous acuminated ſeeds. This plant grows wild in boggy places in divers parts of England.

COMA SOMNOLENTUM is when the patient continues in a profound ſleep, and when awaked, immediately relapſes, without being able to keep open his eyes. This is a primary diſeaſe, and muſt have a cauſe which obſtructs the paſſage of the nervous fluid from the cortical part of the brain to the medulla oblongata, throughout the whole brain.

A coma ſomnolentum is divided into ſerous and ſanguine. The firſt requires the natural ſerous evacuations to be reſtored or promoted; gouty fits are to be invited. Sternutatories are alſo of great uſe, as they diſcharge the ſerum through the noſe, and ſtimulate the nerves: and when a viſcid phlegm offends the ſtomach, vomits are uſeful, with powder of ſquills, or emetic tartar, with a laxative potion. In a ſanguine coma ſomnolentum, when the blood circulates ſlowly, or ſtagnates in the head, as in hypochondriac and ſcorbutic caſes, all hot ſpirituous remedies are as bad as poiſon; but bleeding, clyſters, gentle laxatives, cooling and nervous powders, are uſeful.

COMA BERENICES, in aſtronomy, a conſtellation of the northern hemiſphere, ſituated between Virgo, Bootes, Canes venatic, and near the Lion's tail; this conſtellation comprehends, according to Ptolemy's catalogue three ſtars; Tycho's thirteen, and in the following forty-three. Catullus tells us in a Latin poem, that this is the Hair of Berenice, the wife of king Evergetes, who vowed to cut off her hair if her huſband returned home from the war victor; which accordingly ſhe did, and ſent it to the temple of Venus, from whence it was ſaid to be taken up into heaven and made a conſtellation.

Order.	Magn.	Name.	Bayer Let.	Right Aſcenſion	Diſtance from Nor. Pole.	Var. in Right Aſcen.	Var. in Declination.
				° ′ ″	° ′ ″	″	″
1	7			177.22. 0	66.32.58	44.7	20.0
2	6			177.59.53	67.11.54	44.5	20.1
3	6			179.37. 8	71.51. 0	44.2	20.1
4	6			179.53.41	62.47.15	44.2	20.1
5	6			179.59.56	68. 7.15	44.2	20.1
6	5			180.57.30	73.46.15	44 0	20.1
7	4.5		*b*	181. 3.28	64.43. 0	44 0	20.1
8	7			181.48.22	65.38.40	44.0	20.1
9	6			181.51.20	60.29.40	44.0	20.1
10	6			181.55.21	60.12. 0	44.0	20.1
11	4.5			182. 8.52	70.52.50	44.0	20.1
12	5			182.36.14	62 48.58	44.0	20.1
13	4.5		*f*	183. 3.40	62.33.55	44.0	20 1
14	4.5		*b*	183.35.17	61.23.59	43.7	20.1
15	4.5		*c*	183.43.44	60.23.45	43.7	20.0
16	4.5		*a*	183.44.16	61.50.25	43.7	20.1
17	4.5		*d*	184.13.41	62.45 24	43.7	20.1
18	5			184.20.49	64.23.39	43.7	20.0
19	6			184.21.39	61.33.33	43.5	20.0
20	6			184.23.46	67.46. 5	43.5	20.1
21	5		*g*	184.44. 8	64. 6. 9	43.2	20.1
22	7			185.24.33	64.23.54	43.2	20.1
23	4		*k*	185.43.34	66. 3. 7	43.5	20.0
24	5			185.46.10	70.17.57	43.2	20 0
25	6			186.13.39	71.34.46	43.2	20.0
26	5			186.47. 8	67.36.35	43.0	19.9
27	5			188.39.55	72. 6.32	43.0	19.7
28	6			189. 3.31	75. 8. 6	43.2	19.7
29	5			189 13.29	74.34. 1	43.0	19.7
30	6			189.22.14	61. 8.30	42.5	19.7
31	4.5			189.58.53	61. 8.48	43.5	19 7
32	7			190. 3.30	71.36.48	43.0	19.7

Order.	Magn.	Name.	Bayer Let.	Right Aſcenſion	Diſtance from Nor. Pole.	Var. in Right Aſcen	Var. in Decli-nation.
				° ′ ″	° ′ ″	″	″
33	7			190. 6.25	71.34 48	43.0	19.7
34	5			190.21.37	61.26.33	42.5	19.6
35	4-5			190.21.42	67.26.21	42.7	19.6
36	5			191.45.17	71.17.27	42.7	19.5
37	5.6			192.10.14	75.54.41	42.0	19.5
38	6			192.18.44	71.33.59	42.7	19.4
39	5			193 39.36	67.32.35	42.2	19.3
40	6			193.39 40	66. 5.15	42.2	19.3
41	4.5			193.54.25	61. 4.43	41.7	19.2
42	4.5			194.34.27	71.11.56	42.5	19.0
43	5.6			195. 9.41	60.54.55	41.5	18.9

COMB, an inſtrument to clean, untangle, and dreſs flax, wool, hair, &c.

Combs for wool are prohibited to be imported into Britain.

COMB is alſo the creſt, or red fleſhy tuft, growing upon a cock's head.

Lady's COMB, or Venus's comb, in botany, the ſame with the ſcandix. See the article SCANDIX.

COMBAT, in a general ſenſe, denotes an engagement, or a difference decided by way of arms.

COMBAT, in our ancient law, was a formal trial of ſome doubtful cauſe or quarrel by the ſwords or battons of two champions. This form of proceeding was very frequent, not only in criminal, but in civil cauſes; being built on a preſumption that God would never grant the victory but to him who had the beſt right. The laſt trial of this kind in England, was between Donald lord Ray, appellant, and David Ramſay, Eſq. defendant; when, after many formalities, the matter was referred to the king's pleaſure.

COMBATANT, in heraldry, a term for two beaſts, as lions, &c. borne in a coat of arms, in a fighting poſture, with their faces to each other.

COMBINATION is properly underſtood of an aſſemblage of ſeveral things by two and two: but is more particularly uſed in mathematics, to denote the variation or alternation of any number of quantities, letters, ſounds, or the like, in all the different manners poſſible.

P. Merſenne gives us the combinations of all the notes and ſounds in muſic, as far as 64; the ſum whereof amounts to 90 figures, or places.

The number of poſſible combinations of the 24 letters of the alphabet, taken firſt two by two, then three by three, &c. according to Mr. Preſtet's calculation, amount to 1391724288872529994251284934402200.

F. Truchet, in the Memoirs of the French Academy, ſhews, that two ſquare pieces, each divided diagonally into two colours, may be arranged and combined ſixty-four different ways, ſo as to form ſo many different kinds of chequer-work; which appears very ſurpriſing, when we conſider that two letters, or figures, can only be combined twice.

Problem 1. Any number of quantities being given, together with the number in each combination, to find the number of combinations.

One quantity, we obſerve, admits of no combination; two, *a* and *b*, of one; of three, *abc*, there are three combinations, viz. *ab*, *ac*, *bc*; of four, ſix, *ab*, *ac*, *bc*, *ad*, *bd*, *cd*; of five, ten, *ab*, *ac*, *bc*, *ad*, *bd*, *cd*, *ae*, *be*, *ce*, *de*; whence it appears that the number of combinations proceed as 1, 3, 6, 10, 15, &c. wherein, if we have n for the number of terms or quantities to be combined, we ſhall have $\frac{n}{1} \times \frac{n-1}{2}$ for all the different pairs that can be taken in the number of quantities n. If the propoſed combinations are to be taken three by three, $\frac{n}{1} \times \frac{n-1}{2} \times \frac{n-2}{3}$ will expreſs the number of combinations ſought: but if they are to be taken by fours, $\frac{n}{1} \times \frac{n-1}{2} \times \frac{n-2}{3} \times \frac{n-3}{4}$ will be the anſwer; and univerſally, if p be put for the number of quantities to be taken each time, then will $\frac{n}{1} \times \frac{n-1}{2} \times \frac{n-2}{3} \times \frac{n-3}{4} \times \frac{n-4}{5}$, &c. continued to p terms, repreſent the number of combinations of p things in n.

Example. Let the number of quantities to be combined be 8, and 4 the number of them to be taken; then by expounding n by 8, and p by 4, we ſhall have $8 \times \frac{7}{2} \times \frac{6}{3} \times \frac{5}{4}$, or 70, for the number of combinations required.

The number of all the poſſible combinations, beginning from the combinations of every two, will, by writing ſucceſſively for p the numbers 2, 3, 4, 5, &c. be $\frac{n}{1} \times \frac{n-1}{2} + \frac{n}{1} \times \frac{n-1}{2} \times \frac{n-2}{3} + \frac{n}{1} \times \frac{n-1}{2} \times \frac{n-2}{3} \times \frac{n-3}{4}$, &c. which is well known to be the ſum of the unciæ of the binomial $1 + 1$, raiſed to the n power, and abridged of the exponent of the power increaſed by unity $n + 1$; therefore the number of all the poſſible combinations will be expreſſed by $2^n - n - 1$.

Problem 2. Any number of quantities being given, to find the number of changes and alterations which thoſe quantities, combined in all the manners poſſible, can undergo.

Suppoſe two quantities, *a* and *b*; their variations will be 2: conſequently as each of thoſe may be combined, even with itſelf, to theſe there muſt be added two variations. The whole number, therefore, will be $2 + 2 = 4$. If there were three quantities, and the exponent of the variation were 2, the combination will be 3, and the changes 9; to

which if the three combinations of each quantity with itself, *aa*, *bb*, *cc*, be added, we shall have the number of changes $3+3+3=9$. In like manner it is evident, if the given quantities were 4, and the exponent 2, the number of changes would be 16; if 5, 25, &c. and, in general, if n, n^2.

Suppose the quantities 3, and the exponent of variation 3; the number of changes is found $27 = 3^3$; viz. *aaa*, *aab*, *aba*, *baa*, *abb*, *aac*, *aca*, *caa*, *abc*, *bac*, *bca*, *acb*, *cab*, *cba*, *acc*, *cac*, *cca*, *bba*, *bab*, *bbb*, *bbc*, *cbb*, *bcb*, *bcc*, *cbc*, *ccb*, *ccc*.

After the same manner it will appear, that if the quantities were 4, and the exponent 3, the number of changes would be $64 = 4^3$: and, in general, if the number of quantities be $= n$, and the exponent 3, the number of changes will be n^3. By thus proceeding, it will be found, that if the number of quantities be n, and the exponent n, the number of changes will be n^n; wherefore, if all the antecedents be added, where the exponent is less, the number of possible changes will be found $n^n + n^{n-1} + n^{n-2} + n^{n-3} + n^{n-4} + n^{n-5} + n^{n-6}$, &c. till at length, the number subtracted from n leaves 1, because the beginning is from single quantities taken once.

Since then the number of possible changes is in a geometrical progression, whose first term is n, the greatest n^n, and the ratio n, it follows that $\frac{n^{n+1}-n}{n-1}$ will express the number of possible changes. Suppose v. gr. $n=4$, then $\frac{n^{n+1}-n}{n-1}$ will be equal to 340. Suppose again, $n=24$, the number of possible changes will be 1391724288872529994251284934034022oo. In so many various manners, therefore, may the twenty-four letters of the alphabet be varied and combined among themselves.

COMBINATORY, in general, denotes something belonging to combination. See the preceding article.

COMBINATORY *Distillation*, a method of rectifying spirits, much practised by distillers, by distilling several ingredients along with the spirits; such are alcaline salts, and spirits, and other saline bodies capable of giving the spirits a good flavour. This method is condemned by Dr. Shaw, because these ingredients mix themselves so intimately with the spirits, as not to be easily separated again: hence, instead of rectifying or improving, they prevent the true and genuine taste of the spirits.

COMBUST, an appellation given to a planet when in conjunction with, or not distant above eight degrees and thirty minutes from the sun: some restrain the term combust to the distance of half their disk.

COMEDY, is a sort of dramatic poetry, which gives a view of common and private life, recommends virtue, and exposes the vices and follies of mankind in an humorous and merry way. Scaliger defines comedy a dramatic poem, representing the business of life, whose event is fortunate and still familiar. Vossius defines it a dramatic poem, copying the actions of the principal citizens and common people in a familiar style, and not without mirth and raillery.

COMET, an opake, spherical and solid body like a planet, performing revolutions round the sun in elliptical orbits, which have the sun in one of the foci. The particulars in which they differ from the planets, are that they move in various directions, some the same way with the planets, others the contrary: neither are their motions confined within the zodiac, their orbits admitting of any inclination to the ecliptic whatever; and the excentricity of their orbits is so very great, that some of the comets perform the greatest part of their motion almost in right lines, tending in their approach to the sun almost directly towards it, after which they pass by it; and when they leave it march off again nearly in a right-line, till they are invisible.

Though the ancients knew little of the use of conic sections, in comparison of what has been discovered within these last hundred and fifty years, yet they applied themselves to the study of their properties, and thereby prepared the way for the readier applying them to the uses lately found out. If those who at that time employed themselves in making astronomical observations, had been as careful in attending to the motion of comets, which do not require such depth of thought as abstruse mathematical problems; though they knew too little then of the principles of motion to have found out their real path, yet probably we should not have been so much at a loss, as we still are, as to their periods; but, by comparing their motions in different returns, even though the observations had been but gross, might have arrived to a considerable perfection in the astronomy of comets. But as most of their periods seem to be very long, and it is but a little while that their motions have been carefully watched, it may be some ages yet, before we get any great knowledge about them. Most of the ancients, being of Aristotle's opinion, that comets were only inflamed vapours, raised, continuing, and dispersed in our atmosphere, took little further notice of them than as omens, often mentioning neither the time of year, or place they were seen in; and unless both are known, we can neither find their orbit, nor compare them with that of any known comet. Seneca indeed, and some others whom he mentions, believed comets to be lasting heavenly bodies, Nat. Quæst. VII. 3 & 22. that multitudes of them, which could not be seen on account of their position, kept on their stated course, and at certain times, when they got to the nearest end of their path, came within sight of men,

chap. 13, 17, 19. and he expected that time and pains would discover what was then unkown, and posterity wonder that they did not know such plain things, chap. 25. In these several places there is a better guess about comets, than any made for above fifteen hundred years afterward: and further search has since confirmed what he thought, that it is the excentricity of their orbits which occasions their being only now and then seen. In all those dark ages, from the decline of the Roman empire to the reformation, comets being only considered as ominous meteors, three only have been yet found described enough to determine their orbits, and those but in a gross manner: and I think Appian was the first, who, about 1530, began to observe their motion astronomically; and soon found that, so far from being within our air, they, having no sensible parallax, must needs be much further off than the moon: here then is the first step toward finding out the true nature of comets; and from that time all astronomers have allowed their place to be among the planetary orbits, and many observations were made of their motions by Tycho Brahe and others.

The two comets of 1664 and 65, coming within a few months of one another, made many persons very inquisitive about them; and in Birch's history of the Royal Society, vol. II. there are two remarkable guesses, both read May 23, 1666. In page 93, are Mr. Hooke's remarks on Monsr. Petit's dissertation on the nature of comets, presented to the society some weeks before. What that paper contained does not fully appear; but Mr. Hooke said, the hypotheses were very ingenious, and some of them not improbable, but whether the comets were moved in equal spaces of a curve line in equal spaces of time, which Monsr. Petit seemed inclined to believe, deserved to be further examined. This last clause is remarkable, and that paper, if still preserved, is worth searching, to see how near Monsr. Petit was to guessing the truth. The other paper, page 91, is Mr. Hooke's own, endeavouring to account for the planet's motions; where, having proposed the resistance of the æther, he says, the second cause of inflecting a direct motion into a curve may be from an attractive property of the body placed in the center, whereby it continually endeavours to attract or draw it to itself: for if such a principle be supposed, all the phænomena of the planets seem possible to be explained, by the common principle of mechanick motions; and possibly the prosecuting this speculation may give us a true hypothesis of their motions. By this hypothesis the phænomena of the comets as well as of the planets may be solved, and the motion of the secondary as well as their primary planets: the motion also of the progression of the auges is very evident. This I think was much about the time that Sir Isaac Newton discovered the property of gravity, and seems much like it; only Sir Isaac, being the deeper mathematician, prosecuted the matter further, and cleared it up more fully.

Hevelius was too good an astronomer, not to see that comets were far distant from the earth, and in his Cometographia, Book III. p. 149—164, largely shews the absurdity not only of supposing them in our air, but even below the moon, from the vast parallax they would have, and the various places they must needs be seen in at different times of day, as they rise towards the zenith, or descend to the horizon: yet could he not shake off the established opinion that they were meteors; but, to reconcile both, supposes comets to be vapours collected near any of the planets, whirling round about it till thrown out of the atmosphere, and then moving in a straight or curve line till dispersed, Book VII. p. 384; that comets are not spherical, but round and flat, p. 338; and, from the time they leave the planet's atmosphere, always turn one flat side toward the sun, p. 666; and though, Book IX. p. 591—632, he calculates the places of several comets, as if moving in a straight line, and generally comes nearer the observed place, than I should expect such an hypothesis to do; yet he thinks that their course is not really straight, p. 588; and in more largely treating on the subject, says, it is a parabola, p. 659. It may surprize those who have not read Hevelius, to hear that he first said a comet's orbit is parabolical, a discovery generally attributed to Sir Isaac Newton; and indeed not without reason, for Hevelius did but guess it, and knew not the principle on which its motion depended; but it was Sir Isaac Newton who first proved it, and accounted for its motion in that curve, from that universal principle of gravity, on which the motion of all the heavenly bodies depend. We may however give Hevelius his due praise as a good astronomer, and by a short extract from his Cometographia, Book IX. shew how nearly he guessed at the true motion of comets, without knowing, or even suspecting, the real cause which kept them in such a trajectory. A comet then, he says, "by no means moves in a "straight line, but in a curve, always concave toward the sun," p. 658, that is, "in a parabola," p. 659: this he illustrates by "the parabolic motion of projectiles," p. 660. He seems here to be got very near the point, yet shews afterward he did not think of gravity as the cause of a comet's parabola: for "as projectiles move in a parabola, "from a compound of their progressive motion and "gravity, so comets also have a double motion; "one the force given them at leaving the planet's "atmosphere, the other not gravity, yet something "not unlike it, by which comets turn one of their "flat sides toward the sun, as the center of our "system, p. 666, as a magnetic needle points toward the north, or toward a loadstone. And as "in projectiles gravity, so in comets the inclination "of their flat sides, turns them out of their straight "course,"

" courſe," as a rudder turns about a ſhip, which he had before largely conſidered, p. 570—587. " And " the farther a comet gets from the ſun, the more " will its flat ſide be oppoſed to its motion, which " will not only more and more retard its ſwiftneſs, " but turn it out of its ſtraight courſe, p. 667. " But a comet differs from a projectile, in that a " body thrown up moves ſloweſt at the vertex of " its parabola, and ſwifter both in riſing and fall- " ing; while a comet moves ſwifteſt at the vertex, " where a line from the ſun is perpendicular to its " path, and ſlower both in approaching the ſun and " retiring from it, p. 669. If you aſk whether a " comet's path is not an hyperbola," he " will not " deny it: it is neither circle nor ellipſis, but may " be any other ſection of a cone, which is moſt " bent in the middle, and ſtraighter at each end: " yet is ſatisfied it is rather a parabola than an hyper- " bola," p. 683. Laſtly, " as the planets regard " the ſun as their center, ſo the comets alſo obey it " in their way," p. 701. We ſee here that Hevelius, whether by a mere gueſs at what he thought muſt needs follow from his notion of comets being flat bodies, generally ſtanding oblique to the path they move in, or finding ſuch a motion to agree beſt with his obſervations, came very near to what has ſince been found to be the truth: that comets move in a parabola, concave toward the ſun, ſwifteſt at the vertex, that is, when they are neareſt the ſun, and their motion perpendicular to a line from it, and that it is an action of the ſun on comets which makes them turn out of a ſtraight line into a curved trajectory. So far he is right, and ſeems got near the point, but is defective in not ſuſpecting the ſun to be the parabola's focus, expreſsly denying their moving in an ellipſis, and conſequently returning again; and the doctrine of gravity being a later diſcovery, he is forced to account for their curve another way. We may learn alſo from his book, that ſtudies, of which we do not at firſt ſee the benefit, are not therefore always uſeleſs. Hevelius made many obſervations and calculations of the motion of comets; on which if a perſon at that time had ſaid to him, *cui bona?* why ſo much time and pains ſpent on vapours, which were collected yeſterday, and will be diſperſed to-morrow? he, owning them to be nothing elſe, could not perhaps have given any ſufficient reaſon for it: yet if he and others had not taken that pains, Sir Iſaac Newton would hardly have found out their real motion; and there is a field yet open for further diſcoveries of future ages about them.

Sir Iſaac Newton having diſcovered that gravity is univerſal, and that a planet whoſe velocity was in a due proportion to its gravity toward the ſun, would revolve about it in a perfect circle; but in an ellipſis, of which the ſun is one focus, if its motion was either faſter or ſlower; on conſidering the matter, on occaſion of that remarkable comet of 1680, he found, that, if a body is thrown with a velocity, which is to that neceſſary to keep it in a circle, as the ſquare root of 2 to 1; the ſame univerſal principle of gravity will make it move in a parabola, of which the ſun is the focus: and this being found agreeable to the obſerved motion of comets, has been ſince allowed by aſtronomers to be their real motion. It ſeems however not agreeable to the uniformity of the univerſe, that after a ſhort view of the ſun, they ſhould be continually flying farther off, in that wide void beyond the planetary bounds, to creep along that dark cold region for millions of years; (and in leſs time than that, they could not reach any other ſyſtem, if the parallax of the fixed ſtars be two ſeconds, which Dr. Bradley has found it cannot exceed;) but that they ſhould rather revolve round the ſun, in certain, though long periods: and the likeneſs of the elements of ſome of the comets ſeen in different ages, make it probable they were the ſame returning again; if ſo, their trajectories are not really parabolas; but they ſeem a kind of planets, revolving round the ſun in ſo extreamly excentric ellipſes, that, ſo far as we can ſee them, they are not ſenſibly different from parabolas, which for eaſe of calculation we always ſuppoſe them to be: and that their motion is almoſt exactly a parabola, is eaſy to be demonſtrated. The true motion of comets being thus known, Sir Iſaac Newton applied himſelf to find a method, by which a comet's orbit might be determined from a courſe of obſervations; and, having attempted many ways in vain, hit at laſt on one, which he has explained, Book III. Prop. 41, &c. of his Principia, taking for his example the comet of 1680. The ſame method Dr. Halley uſed for twenty-three more, ſome accurately, others groſsly, as the obſervations he met with were; and ſeveral more have been done ſince by others. From the likeneſs of the elements, ſome of theſe are ſuppoſed to be different returns of the ſame comet: firſt, thoſe of 1531, 1607, and 1682, with a period of 75 or 76 years, may be expected again about 1758: ſecondly, thoſe of 1532 and 1661, after a period of 128½ years, may probably return about 1789: thirdly, the obſervations of that in 1556 were very groſs, and thoſe in 1264 ſtill more defective, ſo that neither orbit can be ſuppoſed to be at all accurate; yet from their likeneſs, though not agreeing very well, may not unlikely be the ſame, and come again, after a period of 292 years, about 1848: laſtly, the comet of 1680 was a very remarkable one; and as at equal intervals, A. C. 44, A D. 531, and 1106, others were ſeen in ſome reſpects like it, ſeveral perſons have ſuppoſed they might be the ſame, being 575 years going round the ſun; yet no obſervations being made at any of the three former times, it was but a gueſs; and if the comet of 1106 was ſeen in March in Cancer, as the manuſcript Mr. Dunthorne mentions, Phil. Tranſ.

Tranſ. XLVII. p. 287, ſeems to ſay, it could by no means be the ſame as that of 1680, which cannot get beyond Taurus in March, nor be ſeen in Cancer after December; the period therefore of that comet muſt remain doubtful, till further light appears.

It may be objected, that the two periods of the comet of 1682 being a whole year different one from the other, there is no knowing when to expect it again. The difference indeed is very great, conſidering how true the planet's motions are found to be; yet I fear we muſt not expect the ſame regularity in a comet's orbit as in a planet's, they being ſubject to many great errors: firſt, croſſing all or moſt of the planet's paths, they may come nearer to one or other of them than any of the planets do to each other, and be more affected by their mutual attraction; eſpecially if near Jupiter or Saturn, the greatneſs of which bodies, weaker power of the ſun, flowneſs of their motion, and conſequent long continuance near one another, and direction of the comet's path nearly toward the ſun, all join to make the alteration of its orbit more ſenſible: 2dly, a ſmall change of angle will make little difference in a planet's orbit, which is always nearly perpendicular to the ſun; but when a comet's path makes only five or ten degrees angle with a line from the ſun, a little variation will bear a greater proportion to that ſmall angle, than to 90 degrees: 3dly, as a comet's greateſt diſtance is many times its leaſt, if by a planet's attraction the perhelion is altered but a few miles, that may be greatly multiplied in the aphelion; and if the angle at firſt is changed but one minute, it may make a great alteration of length, in running four times as far as Saturn, and back again: 4thly, there is but little difference in the velocity of a body, going round the ſun in one or two hundred years, and of one keeping a perfect parabola; ſmall therefore muſt be the difference of one revolving in 75 or 76 years, eſpecially if the ſame power, which increaſes its velocity, ſhould make its perihelion diſtance greater. Now the comet of 1682, in its deſcent toward the ſun, may be near Mars, but that being ſmall will hardly affect it much; again, in going from the ſun, it may paſs near Venus, a little before it gets to the deſcending node, and near the earth a little after it: if then one or more of theſe planets ſhould be in that part of their orbit when the comet paſſes by, they may make ſome change in its motion. The comet of 1680 is very liable to alteration, as in its deſcent it may paſs not remote from any of the planets, extremely near the earth, and but a little way from Venus; its motion alſo being all the time almoſt directly toward the ſun, and its perihelion diſtance ſo very ſmall, a little change in its motion might make a very great one in its orbit.

The method Sir Iſaac Newton gives, in his Principia, is from three obſervations of a comet, at proper intervals, to find its real trajectory; and Book III. Prop. 41, he has explained in order the ſeveral proceſſes, deſigned chiefly for conſtruction, which was the way he uſed in his example of the comet of 1680. This operoſe problem Dr. David Gregory has more fully explained and demonſtrated, in the fifth book of his aſtronomy: it may alſo be reduced to triangles, and calculated by numbers, which is much more accurate than conſtruction by lines; and though conſiſting of about an hundred triangles, Dr. Halley undertook it for 24 comets, as others have ſince for 20 more; and ſome of them, by greater care or nicer obſervations to a very great degree of exactneſs. Yet as a compleat liſt of the triangles uſed, and ſeveral cautions neceſſary in practice, are not publiſhed, I have choſen to ſet them down here, not generally repeating the demonſtrations, which Sir Iſaac Newton and Dr. Gregory have already done, but ſuppoſing one of thoſe books at hand, to add ſome obſervations for preventing miſtakes, and ſhewing how it may be reduced to triangles: the letters here uſed are the ſame as in Sir Iſaac Newton, except ſome few which he had not, and are generally thoſe which Dr. Gregory uſes.

He then who would calculate a comet's orbit by triangles, ſhould firſt conſtruct it as true as may be by lines; for as the method is approximation, it is to no purpoſe to calculate nicely, while the point tried is much wrong, as the firſt gueſs will moſt likely be; and as the accuracy depends on having, in *fig.* 2.) B near μ, (ſee Greg. V. 18, 19.) he cannot at firſt chuſe ſuch obſervations as will make it ſo. Firſt therefore, out of a ſet of obſervations on a comet, chuſe three ſo that you geſs that interval of time when the comet was neareſt the ſun is the ſhorteſt, but no great nicety is required this firſt time. On a large ſheet of paſteboard, draw a circle ten inches radius for the *magnus orbis*; mark the points the earth was in at the three times of obſervation, and call them T, t, and τ, (ſee *fig.* 1); from theſe draw the three obſerved longitudes of the comet, TA, tB, and τC: on tB take any point B, let V be the interſection of St and Tτ, and γ the place the comet was in perpendicularly over B; make $S\gamma^3 : SB \times R^2 :: tV : BE$, which ſet off on the line SB: through E (Newton's Princip. III. lemma 7.) draw AC cutting TA and τC, ſo that AE : EC as the time between the firſt and ſecond obſervations, to the time between the ſecond and third. A and C are near enough for the firſt trial, the curtate places of the comet in its orbit. To try how true they are, let TA be to the perpendicular AM, as radius to the tangent of the comet's apparent latitude the firſt time, and τC : CN :: R : tang. of apparent latitude the laſt time, and draw MN the chord of the parabolick arc MγN, along which the comet moved, while the projection of the points on the ecliptick are A, B, C: then ſay $SB : S\gamma :: SB + \frac{2}{3}BE$ to a fourth number nearly

equal to (S R, see Greg. V. 20.) the distance from the sun at which a comet would move the chord M N, in the same time as it really did go the arc M γ N : let X be the length run by a comet at the earth's mean distance from the sun, in the time between the first and third observations (Newton's Prin. III. 40.) then $\sqrt{}$ S R : $\sqrt{}$ radius :: X : M P, being the length a comet would go in the same time at the height S R. If M N be equal to M P, the point B was taken right; but if very different, as may easily be this first time, take a new point b, find ac, and try till M N is nearly equal to M P. Being now near the matter, we must be more exact: bisect the truest A C in I, (see *fig.* 2.) erect a perpendicular I i = B b, draw S i, and erect $\lambda\mu$: if μ falls on or near B, the observations are rightly chosen; if not, take one or more new observations, to make B as near as possible to μ, and rather between i and μ than otherwise, (Greg. V. 18, 19.)

The circle drawn for the *magnus orbis* will do again, as will T, t and τ, if carefully drawn as to angle and distance, and the same observations are still used; as also the three longitudes T A, t B, and τ C. Set off t B as near as now known, draw A C as before, bisect in I, erect the perpendicular I i = B b, (see fig. 2.) complete the rectangle I i $\lambda\mu$, and μ is nearly the vertex of the parabolic arc A B C; (Greg. V. 19. coroll.) but may be further corrected thus. Produce I μ to η, so that $\mu\eta = \frac{1}{2}$ I μ; through S draw $\eta\xi = 3$ S η, in the line B ξ take a new point E', and if the former length B E is not true enough, which yet it will generally be for construction, a truer length for BE' may be found as directed presently for calculation, thus: a sidereal year is to the time between the first and third observations, as the circumference of a circle to the length of the mean arc the earth moves in that time; the square of half that arc divided by twice the radius, is the fall of the earth in half the time: this, if now done accurately, need not be repeated in N°. 7 of the calculation: then S B : S γ :: S B + $\frac{1}{3}$ I μ : S L and S L^3 : R^2 × $\overline{\text{S B} + \frac{1}{3}\text{I}\mu}$ :: the fall of the earth : B E' the fall of the comet. Through E' draw A' C', and form the rectangle I' i' λ' μ', μ' is the vertex of the parabolick arc, (Greg. V. 19. coroll.) and B ξ divides the chord very nearly in proportion to the times (V. 18.) It remains then to try whether the point B was guessed right: say then S B : S γ :: S μ' + $\frac{2}{3}$ I' μ' : S R, and as above find M N and M P: if they are not equal, draw G P parallel to C' N, then is C' G the error; take a new length tb, and repeat the process to find a new mn and mp, and error $c'g$. The two figures 3, which are the small part Y C G of *fig.* 1. and 2, shew the two cases of this correction, when C and c are on the same or opposite sides of z; where a line drawn through G and g the two points of error will cut Y C, that is in the point the comet was really over, when, by a wrong guess at the length t B and tb, it came out C and c; and setting off A' F and αf equal to C' G and $c'g$, the true point x may be in like manner found. We may now either proceed to calculate the orbit arithmetically, from the length of t B now very nearly known, or find the elements of the orbit by construction thus; (see fig. 4.) two points of a parabola m and n, perpendicularly over the curtate places x and z, with the focus the sun, determine the whole curve: draw then x z, and erect two perpendiculars $x\,m$ and z n, the tangents of the comet's latitude at the first and third observations, T x and τz being the radii; S ☊ drawn through the sun and the intersection of x z and $m\,n$, is the position of the comet's node. z ϱ a perpendicular let fall from z on S ☊, is to z n the tangent of its latitude, as radius, to tangent of the inclination of the orbit. Produce the perpendiculars $x\,\sigma$ and z ϱ to m and n, as cosine of inclination to radius, which will be in that position to each other, the sun and line of nodes, as the comet was in its orbit at the first and third observations; on m and n (*fig.* 5) with radius S m and S n draw two circles; a tangent to both circles may be drawn by the eye, or thus, bisect $m\,n$, draw a circle on that center passing through m and n, and set of $m\iota = n\gamma =$ S n — S m, which produce to δ and $\varkappa$; $\pi\varkappa\delta$ being parallel to $m\,\gamma$, which is perpendicular to both radii $m\varkappa$ and $n\delta$, touches both circles, and S π a perpendicular on it from S, is double the perihelion distance: (De la Hire's plain conicks.) Wherefore P, the bisection of S π, is the vertex of the parabola or perihelion point, whose position is determined by the angle n S P or m S P; as is the time the comet was there, because the parabolick space n S m, is to the parabolick space m S P, as the time between the observations, to the time between the perihelion and first observation.

Thus are the elements of a comet's orbit found by construction; but if exactness is required, lines will not do it, but the process must be reduced to triangles, and calculated by numbers. And first see that the observations are good, or else be content with construction, for it is to little purpose to calculate nicely by uncertain data. Next try whether the times are rightly chosen, by the directions already given, (see page 7.) and, for further accuracy, be not content with the earth's places as found by the tables of the sun, but correct them by the menstrual parallax. The weight of the earth being to that of the moon as 39 788 to 1, the distance of the moon, is to the distance of the common center of gravity, as 40.788 to 1. (Newton Princ. III. 37. cor. 4 and 6.) In *fig.* 6. E is the earth, and M the moon, revolving round C their common center of gravity which moves regularly along the *magnus orbis* A C B round the sun S; then at any time the sine of the moon's horizontal parallax, is to the sine of the sun's parallax divided by 40.788, as S C to C E. In the triangle S C E, given S C, C E and S C E, then C S E is the required correction of the sun's place, and

and S E the real distance of the earth from the sun. This triangle however need not be solved, the tables IV. and V. giving the required correction in angle, and the length of the line E D, to be added to or subtracted from S C, the distance of the sun as found by the common tables. As the moon has sometimes above five degrees of latitude, and therefore the earth is not absolutely in the plain of the ecliptic, for perfect exactness that should be allowed for; but as the whole menstrual parallax is very small, this, which is but a small part of it, may I suppose be safely neglected. Lastly, before calculating, draw a set of figures suited to the particular case, for no general rule can be given where to add and where subtract; the case I have drawn, and suited the plus and minus to, is the comet of 1742; and another set of figures will shew, whether to add or subtract in that case. Thus prepared, the following is a list of the triangles required, what is given and what is sought, for fixing the due length of the lines, which determine the comet's trajectory.

No.	Trian.	Given.	Sought.	Remarks.
1	S T τ	S T, S τ, and T S τ	S T τ, S τ T, and T τ	S T τ − STY = τ TY. [S τ T − S τ Y = T ι Y
2	T Y τ	T τ and τ T Y (N°. 1) and T Y τ	T Y and τ Y	See fig. 1.
3	S ι B	ι B (a guess) S ι and S ι B	ι S B and S B	ι S τ + ι S B = D S τ
4	ι B γ	γ perpendicularly over B	R : tang. ap. [Lat. : : ι B : B γ	
5	S B γ	S B (N°. 3) B γ (No. 4) S B γ = (90°)	S γ	
6		S B : S γ : : S B + $\frac{1}{3}$ I μ	: S L	[tion I μ taken from the last Construc-
7		365.256 : U + W : : 2 R × 3.14159	: $\chi \psi \omega$	$\frac{\frac{1}{2}\chi\psi\omega^2}{2R} = \zeta\psi$. Greg. I. 25. [cor. 1.
8		S L^3 : R^2 × $\overline{\text{S B} + \frac{1}{3}\text{I}\mu}$: : $\zeta\psi$	: B E	
9	D S τ	S τ, S τ D and D S τ (N°. 3)	S D and τ D	S D + B E − S B = D E
10		W : U + W : : D E	: D Q	A H. equal and parallel to [D Q
11	A H Y	A H (N°. 10) A Y H and A H Y (N°. 9)	A Y and H Y	τ D + H Y − τ Y = H D
12		U : U + W : : H D	: H C	
13	A C H	A H, H C and A H C	A C H, C A H, and A C	A Y C + A C H + Y A C = [180°
14		U + W : U : : A C	: A E	
15	B E b	B E (N°. 8) B b E (= 90°) B E b (= S D τ − A C H)	B b = I i	See fig. 2.
16	S E I	S E (= S B − B E) I E (= $\frac{1}{2}$ A C − A E) S E I (N°. 15)	S I E and S I	S I E + 90° = S I i
17	S I i	S I, I i (N°. 15) and S I i	S i I	
18	I i λ	I i, I i λ (N°. 17) i I λ (= 90°)	$i\lambda$ = I μ	I μ × 1.5 = I η
19	S I μ	S I (N°. 16) I μ and S I μ (= S I E + I λ i)	S μ	
20	S I η	S I, I η (N°. 18) and S I η	η S I and S η	2 S η = S ξ η S I − I S E = η S E [the Suppl. of B S ξ
21	S B ξ	S B, S ξ and B S ξ	S B ξ	Greg. V. 18.
22	B D D	B D D′ (N°. 9) D B D′ (= S B ξ) B D′ (= S D − S B)	B D′ and D D′	
23		S B : S γ : : S μ + $\frac{1}{3}$ I μ	: S L	Greg. V. 21.
24		S L^3 : R^2 × S μ + $\frac{1}{3}$ I μ : : $\zeta\psi$	: B E′	B D′ + B E′ = D′ E′
25	S E′ B	S B, B E′ and S B E′ (N°. 21)	S E′ and B S E′	
		Repeat 10 — 19 to A′ C′, S I′, I′ μ' and S μ'		
11) 27		A′ H′ Y = B D′ D (N°. 22)		τ D + H′ Y − τ Y − D D′ = [H′ D′
15) 31		B E′ b' (N°. 22 and 29)		
16) 32		S E′ (N°. 25) S E′ I′ = Suppl. B E′ b'	+ S B ξ + B S E′	
36		S μ' : S μ + $\frac{1}{3}$ I′ μ'	: S ρ =	
37		S B : γ : : S ρ	: S R	
38	T A′ M	R : tang. Lat. : : T A′	: A′ M	
39	τ C′ N	R : tang. Lat. : : τ C′	: C′ N	
40	M K N	M K (= A′ C′) K N (= C′ N − A′ M) M K N (90°)	M N	
41		$\surd$ S R (N°. 37) : $\surd$ R : : $\chi\psi\omega$ (N° 7)	: M P	Greg. I. 42. and V. 20.

If MN = MP, M and N are two true points in the comet's orbit, proceed therefore to N°. 89; and thence find the elements; but if not equal, take a new point b, so that $\left.\begin{matrix} MN : MP \\ \sqrt{S\gamma'} : \sqrt{S\gamma} \end{matrix}\right\} :: Y\epsilon : Y\epsilon'$, and repeat the whole process, except N°. 1, 2, and 7.

N°.	Trian.	Given.	Sought.	Remarks.
80		MN : NP :: A′C′	: C′G = A′F	
81		$mn : np :: a'c' : c'g = a'f$		See fig. 3.
82	$c'\ p\ g$	$c'g, cpg$ (= A′C′H′ N°. 29) $pc'g$ (N°. 67)	$c'p$ and pg	$YC' - Yc' \mp c'p = C'p$
83		C′G ± pg : C′p :: C′g	: C′z	$\tau C' - C'z = \tau z$
84	}	In like manner find A′x		$TA' - A'x = Tx$
85	}			
86	$T\ x\ m$	R : tang. Lat. :: Tx	: xm	
87	$t\ z\ n$	R : tang. Lat. :: τz	: zn	
88	$x\ Y\ z$	Yx (= Tx − TY) Yz and xYz	Yz x and xz	
89	S T x	ST, Tx and S T x	T S x and S x	
90	S τ z	Sτ, τz and S τ z	τz S and Sz	τz S − Y zx = S zx
91		(zn − xm =) $rn : rm :: zn$	: z ☌	See fig. 4.
92	S z ☌	Sz (N°. 90) z ☌ and Sz ☌ (N°. 90)	zS ☌ and S ☌	τ S z − zS ☌ = τ S ☌. Place [of the node.
93	S $z\rho$	Sz, zS ρ and S ρ z (= 90°)	$z\rho$	
94	$n\ z\ \rho$	$z\rho$, zn and $nz\rho$ (= 90°) $z\rho$: zn :: R	: tang. $z\ \rho\ n$	Inclination of the orbit.
95	S $x\ m$	Sx, xm and S xm (= 90°)	S m	
96	S $z\ n$	Sz, zn and S zn (= 90°)	S n	
97	$r\ m\ n$	rm (N°. 88) rn (N°. 91) mrn (= 90°)	$m\ n$	
98	S $m\ n$	S m, S n and mn	S $n\ m$ and m S n	See fig. 5.
99	$m\ n\ \gamma$	mn, $n\gamma n$ (= Sn − Sm) $m\gamma n$ (= 90°)	$m\ n\ \gamma$	180° − S nm − $mn\gamma$ = nSP [from Node.
100	S n ☌	Sn, S ☌ (N°. 92) S n ☌	nS ☌	nSP − nS ☌ = PS ☌. Perihelion
101	S $n\ \theta$	Sn, nSθ, and Sθn (= 90°)	S θ	$\frac{\theta\pi + S\theta}{2}$ = SP. Perihel. distance.
102		Parabolic space PSn − P Sm, is to P S m, as time between the observations to the time between the perihelion and first observation.		Time of Perihelion

N. B. The parabolic space may be either taken out of the table of the parabola, or calculated in the same manner that was done.

N°. 7. I call the time between the first and second observations U, and that between the second and third W. Then a sidereal year is to the whole time, as the circumference of the circle to the arc moved in that time: and the square of half that arc, divided by twice the radius, is the earth's fall toward the sun in half the time.

N°. 6, 7, 8. I find BE this way rather than Sir Isaac Newton's, which is only an approximation, and irregularly too great or too small, as the times are more or less unequally divided, and T$t\tau$ in the more or less curved parts of the earth's orbit. But this way, if found as in N°. 23, 24 would be true; and Sμ being not yet known, I use S B for it, which is nearly the same: nor is Iμ yet found, but as the comet has been already constructed, it is there given near enough for this process.

N°. 20. Since, by Greg. V. 18, the right line γSξ = 3 Sn is the truth, full as easy, and requiring no taking out natural numbers, is less liable to error, I wonder Sir Isaac chose to approximate it by the point σ, and $\sigma\xi$ = 3 Sσ + 3$i\lambda$. (See his fig. Book III. Prop. 41.)

N°. 23, 24. In Greg. V. 21, the comet's fall at at the height SL is MV = VZ, (see his fig.) Now B and μ nearly coinciding, by similar triangles SB : Sγ (N°. 5) :: Sl (= Sμ + $\frac{1}{3}$Iμ) : SL. Again, SL^2 : R^2 :: $\zeta\downarrow$ (the earth's mean fall) : the fall at the point L. Greg. I. 42. And by similar triangles SL : Sμ + $\frac{1}{3}$Iμ :: the fall at L : BE; then SL^3 : R^2 × Sμ + $\frac{1}{3}$Iμ :: $\zeta\downarrow$: BE. This is the true length of μZ or BE; and seldom sensibly different from BE′, which yet being more perpendicular to AC, is a little shorter; and if BE is so long and so oblique to AC, that the very small angle EBE′ will sensibly alter its length, then the sine of BE′ b : sine of BE b :: BE : BE′ may be something truer.

N°. 36. The third proportional to Sμ + $\frac{1}{3}$Iμ, which is the truth, see Greg. V. 20, is easier found in Logarithms than Sμ + $\frac{2}{3}$Iμ.

N°. 37. It is here fit to shew cause for this considerable variation from Sir Isaac Newton. Greg. V. 20, shews that a body at the height SR (see his fig.) would move the chord AB, while the comet really moved the arc AVB. Now μ, l and ρ, in

fig. 2, are the projection on the plain of the ecliptic of his V, L and R: then S R, the hypothenuſe of the right-angled triangle S ρ R, is Gregory's line S R, and therefore the length ſought. Sir Iſaac's I D = S μ + ⅔ i λ is nearly the ſame as S ρ; but his I O, being the comet's mean height above the ecliptic, may if the time is unequally divided, and the inclination of the comet great, conſiderably differ from the height ſought at S ρ, which is in S μ produced: therefore, as in N°. 23, S B : S γ :: S ρ : S R, by ſimilar triangles.

N°. 38, 39. M and N being the points the comet was really in, perpendicular over A′ and C′, T A′ curtate diſtance, is to A′ M the height, as radius to tang. of the apparent latitude at the firſt obſervation. The like of C′ N.

N°. 41. The reaſon of this double proportion is this: M N, and of courſe A′ C′ and the perpendicular Y e, is too large in the proportion of M N to M P; but M P will increaſe or diminiſh, as √ S γ′ is leſs or greater than √ S γ. Greg. I. 27. This however is very hard to find, and only an approximation at laſt. An eaſier and as good a way is, to compare the error of the laſt conſtruction with the error now found by calculation: thus N P — N P the difference of the errors, is to t B — t B the difference of the gueſſes, as N P the preſent error, to the required correction of t B.

N°. 80, 81. Sir Iſaac Newton takes C G = N P; but as the correction is in the plain of A C, not of M N, I make G the projection of P, as C is of N. And if C G is not parallel to c g (fig. 3.) or C c bears not the ſame proportion to τ C, as A a to T A, it may make ſome difference in the places of x and z, though ſeldom much.

N°. 80, 81, 82, 84, are not wanted if A C is parallel to a c; for then 83 and 85 will be, N P ± n p : N P :: A a : A x :: C c : C z.

Sir Iſaac Newton in his next propoſition, and Dr. Gregory V. 31, ſhew how, by the rule of falſe, to correct ſtill further the comet's orbit as above found: but that I have here omitted, as hoping and expecting that the directions I have given, being contrived to avoid all error as much as poſſible, will give the orbit true enough without that laborious correction, which I can hardly think is much leſs trouble than the calculation of the orbit itſelf. The changing the comet's parabolick orbit into its real elliptical one, by this correction, thereby to diſcover its period, can doubt be at beſt but imperfectly done, from the ſmall part of the orbit we can ſee, eſpecially if ſo true a parabola as the comet of 1744 had: and unleſs we ſee a comet for a very long time, we muſt be content to wait for that more certain, though tedious diſcovery, the returning after another period. If any one however, deſirous of the utmoſt exactneſs, chuſes to undertake this laſt correction, Sir Iſaac Newton and Dr. Gregory have both explained and ſhewn the uſe of it. (See Plate facing the article COMET.) *Barker on Comets.*

COMETARIUM, a curious machine to ſhew the revolution of a comet about the ſun.

Dr. Deſagulier was the firſt who deſcribed it under the character of a planetarium; and by it repreſented the motion of the planet Mercury: but ſince him, it has been deſcribed under the character of a cometarium by Mr. Ferguſon, Mr. Martin, and ſeveral others in their mechanical lectures, being much more adapted to repreſent the motion of a comet, than a planet; becauſe none of the planets deſcribe orbits ſenſibly elliptical; whereas thoſe of the comets are very much ſo.

We ſhall here give the repreſentation of a cometarium (as in Plate XXXVI. *fig.* 1.) adapted to the motion or theory of the comet of the year 1682, whoſe period is 75¼ years.

The conſtruction of the parts of this machine with the rationale is as follows, taken from p. 142. of Mr. Martin's lectures. When the lid is taken off the box, the internal parts appear as in Plate XXXVI. *fig.* 2. N O and Q T are two elliptic wheels turning each other about the foci I and S, by means of a cat-gut ſtring in a groove on their edges, croſſing at K. Theſe oval wheels are fixed on arbors or axes, which paſs through the ſame focus S and I in each; the oval N O is moved by the circular wheel I, fixed alſo upon the ſame axes, but above it upon the bar or long piece G V; which wheel is itſelf moved by another equal wheel G, and that by an endleſs ſcrew turned by a winch on the outſide of the box, all which is evident in the figure.

The perimeter of the oval Q T, where it touches that of N O, will have a velocity always proportional to the diſtance from I; that is, in the points K, 4, 3, 2, 1, &c. The velocities will be as the lines I K, I 4, I 3, I 2, I 1, &c. which we conſider as levers acting upon and moving the oval Q T in thoſe points. Now if the ovals are ſuch that I K, is to S V, or I K, to I r, as 6 to 1, then will the point K have ſix times the velocity turned by the lever I K, as the point V will have when it has made ½ a revolution, or is come under the point S, where it is turned by the lever I s, than in the ſituation I S.

If we take S P = S K = I s, and upon the point s, S, s, as foci, deſcribe the ellipſis P L I M, that will repreſent the orbit of the comet, or the figure of the groove on the lid of the box, in which a round braſs ball, repreſenting the comet, is made to ſlide along on a piece of wire, called the radius vector, fixed at one end into the top of the arbor at S, where we ſuppoſe the ſun to be, and is accordly repreſented by a ſilver plate at top.

The place of the comet at P is called the perihelion, as being there neareſt the ſun; as I is its aphelion or point of greateſt diſtance. Since

SP = SK, the velocity of the comet will be in the point P equal to that of the point K; and were the comet's aphelion at *s*, its velocity then would be equal to that of the point V, when under *s*, viz. ſix times leſs than before; but ſince the comet's aphelion is at I, and ſince the greater arch deſcribed in the ſame time muſt have a greater velocity, the velocity of the comet at I will be about $\frac{4}{5}$ of that at P.

If the ellipſis on the lid of the box be divided into 100 parts, to ſhew the anomaly of the comet, and about the axis of the wheel G be placed a circle E F, divided into equal parts, repreſenting the years or period of the comet, with a proper index pointing to theſe diviſions, the inſtrument will ſhew the ſeveral particulars relating to the theory of elliptic motions, whether of a planet or comet.

COME-UP, in the marine, the order to ſlacken or caſt-off any rope which had been drawn tight on ſome particular occaſion; as, come-up the capſtern, *i. e.* ſlacken the rope on the capſtern; come-up the cat, *i. e.* ſlacken the cat-fall. See the article CAPSTERN and CAT.

COMFRY, *Symphytum*, in botany. See the article SYMPHYTUM.

COMING-TO, or COMING-TO *an Anchor*, in the marine, the ſame with letting the anchor go, to faſten the ſhip in a road, bay, or harbour.

COMITIA, in Roman antiquity, an aſſembly of the people, either in the comitium or campus-martius, for the election of magiſtrates, or conſulting on the important affairs of the republic.

COMITIUM, in Roman antiquity, a large hall in the forum, where the comitia were ordinarily held.

COMMA, among grammarians, a point or character marked thus (,) ſerving to denote a ſhort ſtop, and to divide the members of a period.

COMMA, in muſic, an interval equal to the difference of the tone major and minor, and expreſſed by the ratio 81 : 80. See the articles INTERVAL and TONE.

COMMAND, in the royal navy, implies the rank and power of an officer who has the management of a ſhip of war under twenty guns, called a ſloop, alſo that of an armed ſhip or bomb-veſſel, whence

COMMANDER is an officer who governs a ſloop of war, armed-ſhip, or bomb-ketch, and who has the rank of a major in the army.

COMMANDING GROUND, in the military art, an eminence overlooking any poſt or ſtrong place.

A commanding ground is of three kinds: firſt, a front ground, being an height, oppoſite to the face of ſome poſt, which plays upon its front. Secondly, a reverſe ground, being an eminence that can play upon the back of any poſt. Thirdly, an enfilade commanding ground, being an eminence that, with its ſhot, can ſcour all the length of a ſtraight line.

COMMANDMENT, in a legal ſenſe, is uſed variouſly: ſometimes it is taken for the commandment of the king; as when, upon his own motion, and from his own mouth, he orders any perſon to priſon. Sometimes it is uſed for the commandment of the juſtices: this commandment is either abſolute, or ordinary: abſolute is when a juſtice commits a perſon to priſon for contempt, &c. upon his own authority, as a puniſhment: ordinary is where a juſtice commits a perſon rather for ſafe cuſtody than for puniſhment; the perſon thus committed by ordinary commandment is bailable. In another ſenſe of the word, magiſtrates may command others to aſſiſt them in the execution of their offices, in order to keep the king's peace, &c.

COMMANDMENT is likewiſe uſed for the offence of a perſon that wills or orders another to do ſome unlawful act, as theft, murder, or the like. To command any one to commit burglary, is felony excluded clergy; and he who commands the doing any act that is unlawful, is acceſſary to it and all the conſequences thereof, if executed in the ſame manner as commanded; though not where it varies, or where the commander revokes the command. In treſpaſſes, &c. a maſter ſhall be charged with the acts of his ſervant done by his command: however, ſervants ſhall not be excuſed for committing any crime when they act by command of their maſters, who have no ſuch power over them as to enforce ſuch commandments. The commands of infants or femme-coverts are void.

COMMANDRY, a ſort of benefice, or certain revenue, belonging to a military order, and conferred on ancient knights, who had done ſervices to the order, as the commandries of Malta.

COMMELINA, in botany, a genus of plants whoſe corolla conſiſts of ſix petals, the exterior three of which are ſmall, oval, and concave, of the dimenſions of the perianthium: the three interior and alternate petals are large, roundiſh, and coloured; containinig three ſubulated reclining filaments, terminated with ovated antheræ.

The fruit is a naked roundiſh capſule, with three cells, and divided by three valves, and contains two angulated ſeeds.

COMMENDAM, in the eccleſiaſtical law, the truſt or adminiſtration of the revenues of a benefice, given either to a layman, to hold, by way of depoſitum, for ſix months, in order to repair, &c. or to an eccleſiaſtic, or beneficed perſon, to perform the paſtoral duties thereof, till once the benefice is provided with a regular incumbent.

COMMENSURABLE QUANTITIES, in geometry, are ſuch as have ſome common aliquot part, or which may be meaſured by ſome common meaſure. ſo as to leave no remainder in either. Thus a foot and a yard are commenſurable, there being a

third quantity which will measure each, as an inch taken twelve times makes a foot, and thirty-six times a yard.

COMMENSURABLES are to each other either as units to a rational whole number, or as one rational whole number to another.

COMMENSURABLE NUMBERS, whether integers or fractions, are such as have some other number which will measure or divide them without any remainder; thus, 6 and 1, $\frac{8}{12}$, and $\frac{3}{4}$, are respectively commensurable numbers.

COMMENSURABLE *in Power*, is when the squares of right lines are measured by one and the same space, or superficies.

COMMENSURABLE SURDS, are such surds, as being reduced to their least terms, become true figurative quantities of their kind, and are therefore as a rational quantity to a rational.

COMMENTARY, or COMMENT, in matters of literature, an illustration of the difficult or obscure passages of an author.

COMMENTARY, or COMMENTARIES, likewise denotes a kind of history or memoirs of certain transactions, wherein the author had a considerable hand: such are the Commentaries of Cæsar.

COMMERCE, a term used for the buying, selling, or bartering of all manner of commodities, in order to profit by the same.

COMMINUTION denotes the breaking, or rather grinding, a body into very small particles.

COMMISSARY, in the ecclesiastical law, an officer of the bishop, who exercises spiritual jurisdiction in places of a diocese so far from the episcopal see, that the chancellor cannot call the people to the bishop's principal consistory court, without giving them too much inconveniency.

COMMISSARY, in a military sense, is of three sorts.

COMMISSARY *General of the Musters*, an officer appointed to muster the army as often as the general thinks proper, in order to know the strength of each regiment and company, to receive and inspect the muster-rolls, and to keep an exact state of the strength of the army.

COMMISSARY *General of Stores*, an officer in the artillery, who has the charge of all the stores, for which he is accountable to the office of ordnance.

COMMISSARY *General of Provisions*, an officer who has the inspection of the bread and provisions of the army.

COMMISSARY *of a Ship of War*, the same with purser. See the article PURSER.

COMMISSION, in common law, the warrant or letters patent which all persons, exercising jurisdiction, have to empower them to hear or determine any cause or suit; as the commission of the judges, &c.

COMMISSIONER, a person authorized by commission, letters-patent, or other lawful warrant, to examine any matters, or execute any public office, &c.

COMMISSIONERS *of the Navy*, certain officers appointed to superintend the marine under the direction of the lord-high-admiral, or lords commissioners of the admiralty.

The duty of these officers does not extend to the internal government of ships in commission either at sea or in port, as they are invested with no military command, but is more immediately concerned in the building, docking, repairing, cleaning, &c. of ships in the dock-yards. They have also the appointment of some of the warrant-officers, as masters and surgeons of ships.

The principal officers and commissioners residing at the board are, 1. The comptroller. 2. Two surveyors, who are shipwrights. 3. Clerk of the acts. 4. Comptroller of the treasurer's accounts. 5. Comptroller of victualling accounts. 6. Comptroller of the store-keepers accounts. 8. An extra-commissioner.

Besides these there are three resident-commissioners who manage the affairs of the dock-yards of Chatham, Portsmouth, and Plymouth; for an account of whose duty see the article DOCK-YARD.

COMMISSIONERS *for victualling the Navy*, certain officers appointed to contract for, and furnish the king's ships, or fleets with provisions of all species. See the article VICTUALLING-OFFICE.

COMMISSURE, in architecture, &c. the joint of two stones, or the application of the side of one to that of the other.

COMMITMENT, in law, the sending of a person, charged with some crime, to prison, by warrant, or order.

COMMITTEE, one or more persons to whom the consideration or ordering of a matter is referred, either by some court, or by the consent of parties, to whom it belongs.

COMMITTEE *of Parliament*, a certain number of members appointed by the house for the examination of a bill, making report of an inquiry, process of the house, &c.

COMMODITY, in a general sense, denotes all sorts of wares and merchandises whatsoever, that a person deals or trades in.

Staple COMMODITIES, such wares and merchandises as are commonly and readily sold in a market, or exported abroad; being, for the most part, the proper produce or manufacture of the country.

COMMODORE, a general officer of the marine, invested with the command of a detachment of ships of war on any particular enterprise, during which time he bears the rank of brigadier general in the army, and is distinguished from the inferior ships

of

of his ſquadron, by a broad red pendant tapering to the outer end, and forked.

COMMODORE is alſo a name given to ſome ſelect ſhip in a fleet of merchantmen, who leads the van in time of war, and carries a light aloft to conduct and keep together the reſt.

COMMON, ſomething that belongs to all alike, in contradiſtinction to proper, peculiar, &c. Thus the earth is ſaid to be our common mother.

COMMON DIVISOR, is a quantity or number which exactly divides two or more quantities without leaving any remainder.

COMMON, in geometry, is applied to an angle line, or the like, which belongs equally to two figures.

COMMON LAW, that body of rules received as law in England, before any ſtatute was enacted in parliament to alter the ſame.

COMMON-PLACE BOOK, *Adverſaria*, among the learned, denotes a regiſter of what things occur worthy to be noted in the courſe of a man's ſtudy, ſo diſpoſed, as that among a number of ſubjects, any one may be eaſily found.

COMMON-PLEAS is one of the king's courts now held conſtantly in Weſtminſter-hall, but anciently was moveable.

COMMON, in law, that ſoil, the uſe of which is common to this or that town or lordſhip.

COMMON PRAYER is the liturgy in the church of England.

COMMON, in grammar, denotes the gender of nouns which are equally applicable to both ſexes: thus *parens*, a parent, is of the common gender.

COMMON, in geometry, is applied to an angle, line, or the like, which belongs equally to two figures.

COMMONS, or *Houſe of* COMMONS, a denomination given to the lower houſe of parliament. See PARLIAMENT.

COMMONS, or COMMONALTY, likewiſe ſignifies the whole body of the people under the degree of a baron, whether knights, gentlemen, burgeſſes, yeomen, &c.

COMMONWEALTH, the ſame with republic. See the article REPUBLIC.

COMMOTION, an inteſtine motion in the parts of any thing.

COMMUNICATION, in a general ſenſe, the act of imparting ſomething to another.

COMMUNICATION is alſo uſed for the connection of one thing with another, or the paſſage from one place to another: thus a gallery is a communication between two apartments.

COMMUNICATION *of Idioms*, in theology, the act of imparting the attributes of one of the natures in Jeſus to the other.

COMMUNICATION *of Motion*, in philoſophy, is the action of a moving body, whereby a body at reſt is put in motion, or a body already in motion is accelerated.

Before we proceed to explain the laws, by which bodies communicate their motion from one to another, it is very neceſſary to make a diſtinction between motion and velocity; which ought to be well obſerved, and is as follows.

By the motion of a body (ſometimes called its quantity of motion, ſometimes its momentum) is not to be underſtood the velocity only, with which the body moves; but the ſum of the motion of all its parts taken together: conſequently the more matter any body contains, the greater will be its motion, though its velocity remains the ſame. Thus, ſuppoſing two bodies, one containing ten times the quantity of matter the other does, moving with equal velocity; the greater body is ſaid to have ten times the motion, or momentum, that the other has: for it is evident, that a tenth part of the larger has as much, as the other whole body. In ſhort, that quality in moving bodies, which philoſophers underſtand by the term momentum or motion, is no other than what is vulgarly called their force, which every one knows to depend on their quantity of matter, as well as their velocity. This is that power, a moving body has to affect another in all actions that ariſe from its motion, and is therefore a fundamental principle in mechanics.

Now, ſince this momentum, or force, depends equally on the quantity of matter a body contains, and on the velocity with which it moves; the method to determine how great it is, is to multiply one by the other. Thus, ſuppoſe two bodies, the firſt having twice the quantity of matter, and thrice the velocity which the other has; any two numbers, that are to each other as two to one, will expreſs their quantities of matter (it being only their relative velocities and quantities of matter which we need conſider) and any two numbers that are as three to one their velocities; now multiplying the quantity of matter in the firſt, viz. two by its velocity three, the product is ſix; and multiplying the quantity of matter in the ſecond by its velocity, viz. one by one, the product is one; their relative forces therefore or powers will be as ſix to one, or the moment of one is ſix times greater than that of the other. Again, if their quantities of matter had been as three to eight, and their velocities as two to three, then would their moments have been as ſix to twenty-four, that is, as one to four.

This being rightly apprehended, what follows, concerning the laws of the communication of motion by impulſe, and the mechanical powers, will be eaſily underſtood.

I. In bodies not elaſtic.

Thoſe bodies are ſaid to be not elaſtic, which, when

when they ſtrike againſt one another, do not rebound, but accompany one another after impact, as if they were joined. This proceeds from their retaining the impreſſion, made upon their ſurfaces, after the impreſſing force ceaſes to act. For all rebounding is occaſioned by a certain ſpring in the ſurfaces of bodies, whereby thoſe parts, which receive the impreſſion made by the ſtroke, immediately ſpring back, and throw off the impinging body; now, this being wanting in bodies void of elaſticity, there follows no ſeparation after impact.

When one body impinges on another which is at reſt, or moving with leſs velocity the ſame way, the quantity of the motion or momentum in both bodies taken together, remains the ſame after impact as before; for by the third law of nature, the reaction of one being equal to the action of the other, what one gains the other muſt loſe.

Thus, ſuppoſe two equal bodies, one impinging with twelve degrees of velocity on the other at reſt; the quantities of matter in the bodies being equal, their moments and velocities are the ſame; the ſum in both twelve; this remains the ſame after impact, and is equally divided between them; they have therefore ſix a-piece, that is, the impinging body communicates half its velocity, and keeps half.

When two bodies impinge on each other by moving contrary-ways, the quantity of motion they retain after impact, is equal to the difference of the motion they had before; for by the third law of nature, that which had the leaſt motion, will deſtroy an equal quantity in the other, after which they will move together with the remainder, that is the difference.

Thus for inſtance, let there be two equal bodies moving towards each other, the one with three degrees of velocity, the other with five, the difference of their moments or velocities will be two; this remains the ſame after impact, and is equally divided between them, they have therefore one a-piece; that is, the body, which had five degrees of velocity, loſes three, or as much as the other had, communicates half the remainder, and keeps the other half.

From theſe poſitions it is eaſy to reduce a theorem, that ſhall ſhew the velocity of bodies after impact in all caſes whatever. Let there be two bodies A and B, the velocity of the firſt a, of the other b; then the moment of A will be expreſſed by Aa, and of B by Bb; therefore the ſum of both will be $Aa + Bb$, and $Aa - Bb$ will be the difference when they meet. Now theſe quantities remain the ſame after impact; but knowing the quantities of motion and quantities of matter, we have the velocity (by dividing the former by the latter: therefore $\frac{Ab + Bb}{A + B}$ or $\frac{Aa - Bb}{A + B}$ will in all caſes expreſs the velocity of the bodies after impact.

II. *In elaſtic bodies.*

Bodies perfectly elaſtic, are ſuch as rebound after impact, with a force equal to that with which they impinge upon one another: thoſe parts of their ſurfaces that receive the impreſſion, immediately ſpringing back, and throwing off the impinging bodies with a force equal to that of impact.

From hence follows, that the action of elaſtic bodies on each other (that of the ſpring being equal to that of the ſtroke) is twice as much as the ſame in bodies void of elaſticity. Therefore, when elaſtic bodies impinge on each other, the one loſes and the other gains twice as much motion as if they had not been elaſtic; we have therefore an eaſy way of determining the change of motion in elaſtic bodies, knowing firſt what it would have been in the ſame circumſtances had the bodies been void of elaſticity.

Thus, if there be two equal and elaſtic bodies, the one in motion with twelve degrees of velocity impinging on the other at reſt, the impinging body will communicate twice as much velocity as if it had not been elaſtic, that is, twelve degrees, or all it had; conſequently it will be at reſt, and the other will move on with the whole velocity of the former.

It ſometimes happens, that in bodies not elaſtic, the one loſes more than half its velocity, in which caſe, ſuppoſing them elaſtic, it loſes more than all; that is, the exceſs of what it loſes, above what it has, is negative, or in a contrary direction: thus, ſuppoſe the circumſtances of impact ſuch, that a body which has but twelve degrees of velocity loſes ſixteen; the overplus four is to be taken the contrary way; that is, the body will rebound with four degrees of velocity, v. g. Let it be required to determine the velocity of a body, after impact, againſt an immoveable object. Let us firſt ſuppoſe the object and body both void of elaſticity, it is evident the impinging body would be ſtopped or loſe all its motion and communicate none; if they are elaſtic, it muſt loſe twice as much, and conſequently will rebound with a force equal to that of the ſtroke.

It is ſufficient if only one of the bodies is elaſtic, provided the other be infinitely hard; for then the impreſſion in the elaſtic body will be double of what it would have been, had they both been equally elaſtic; and conſequently the force with which they rebound, will be the ſame as if the impreſſion had been equally divided between the two bodies.

There are no bodies that we know of, either perfectly elaſtic, or infinitely hard; the nearer therefore any bodies approach to perfection of elaſticity, ſo much the nearer do the laws, which they obſerve in the mutual communication of their motion, approach to thoſe we have laid down.

Sir Iſaac Newton made trials with ſeveral bodies, and found that the ſame degree of elaſticity always

appeared in the same bodies with whatever force they were struck, so that the elastic power in all the bodies he made trial upon, exerted itself in one constant proportion to the compressing force. He found the celerity with which balls of wool, bound up very compact, receded from each other, to bear nearly the proportion of five to nine to the celerity wherewith they met; and in steel he found nearly the same proportion; in cork the elasticity was something less, but in glass much greater; for the celerity, with which balls of that material separated after percussion, he found to bear the proportion of fifteen to sixteen to the celerity wherewith they met.

We have hitherto supposed the direction in which bodies impinge upon one another, to be perpendicular to their surfaces: when it is not so, the force of impact will be less, by how much the more that direction varies from the perpendicular; for it is manifest that a direct impulse is the greatest of all others that can be given with the same degree of velocity.

The force of oblique percussion is to that of direct, as the sine of the angle of incidence to the radius.

Let there be a plane as AD (Plate XXXVI. *fig.* 3.) against which let a body impinge in the point D in the direction B D; which line may be supposed to express the force of direct impulse, and may be resolved into two others, B C and B A; the one parallel, the other perpendicular to the plane; but that force which is exerted in a direction parallel to the plane can no way affect it, the stroke therefore arises wholly from the other force expressed by the line B A, but this is to the line B D, as the sine of the angle of incidence A D B to the radius; from whence the proposition is clear.

If the surface of the body to be struck is a curve, then let A D be made a tangent to D, the point of incidence, and the demonstration will be the same.

This is the case, when bodies impel one another by acting upon their surfaces; but in forces, where the surfaces of bodies are not concerned, as in attraction, &c. we must not consider the relation which the direction of the force has to the surface of the body to be moved, but to the direction in which it is to be moved by that force. Here the force of action will be less, by how much the more these two directions vary from each other.

The force of oblique action is to that of direct, as the co-sine of the angle comprehended between the direction of the force, and that wherein a body is to be moved thereby to the radius.

Let F D (*fig.* 4.) represent a force acting upon a body as D, and impelling it towards E; but let D M be the only way in which it is possible for the body to move; the force F D may be resolved into two others, F G and F H, or which is equal to it G D; but it is evident that only the force G D impels it towards M. Now, F D being the radius, G D is the co-sine of the angle F D G, comprehended between the two directions F E and G M; from whence the proposition is clear.

My meaning in both cases will be understood from the instance of a ship under sail. The force by which the wind acts upon the sail, will be less, by how much the more its direction varies from one that is perpendicular to its surface: but the force of the sail to move the ship forward, will be less, by how much the more the direction of the ship's course varies from that in which she is impelled by the sail.

To this we may add the following proposition relating to oblique forces, viz. that, if a body is drawn or impelled three different ways at the same time, by as many forces acting in different directions; and if the quantity of those forces is such, that the body is kept in its place by them, then will the forces be to each other, as the several sides of a triangle, drawn respectively parallel to the directions in which they act.

Let the lines A B, A D, A E, (*fig.* 5) represent the three forces acting upon the body A, in those directions, and by that means keeping it at rest in the point A. Then the forces E A and D A will be equivalent to B A, otherwise the body would be put into motion by them *(contra Hypoth.)* But these forces are also equivalent to A C, consequently A C may be made use of to express the force A B, and E C, which is parallel and equal to A D, may express the force A D, while A E expresses its own: but A C E is a triangle whose sides are all parallel to the given directions; therefore the sides of this triangle will express the relation of the forces by which the body is kept at rest.

Bridge of COMMUNICATION. See the article BRIDGE.

Lines of COMMUNICATION, in military matters, trenches made to continue and preserve a safe correspondence between two forts or posts; or at a siege, between two approaches, that they may relieve one another.

COMMUNION, in matter of religion, the being united in doctrine and discipline; in which sense of the word, different churches are said to hold communion with each other.

COMMUNION is also used for the act of communicating in the sacrament of the eucharist, or the Lord's supper.

COMMUNITY, a society of men living in the same place, under the same laws, the same regulations, and the same customs.

COMMUTATION, in astronomy, is the angular distance between the sun's true place seen from the earth, and the place of a planet reduced to the ecliptic. This angle of commutation is found by subtracting the sun's true place from the heliocentric place of the planet. See HELIOCENTRIC.

COMMUTATION, in law, the change of a penalty

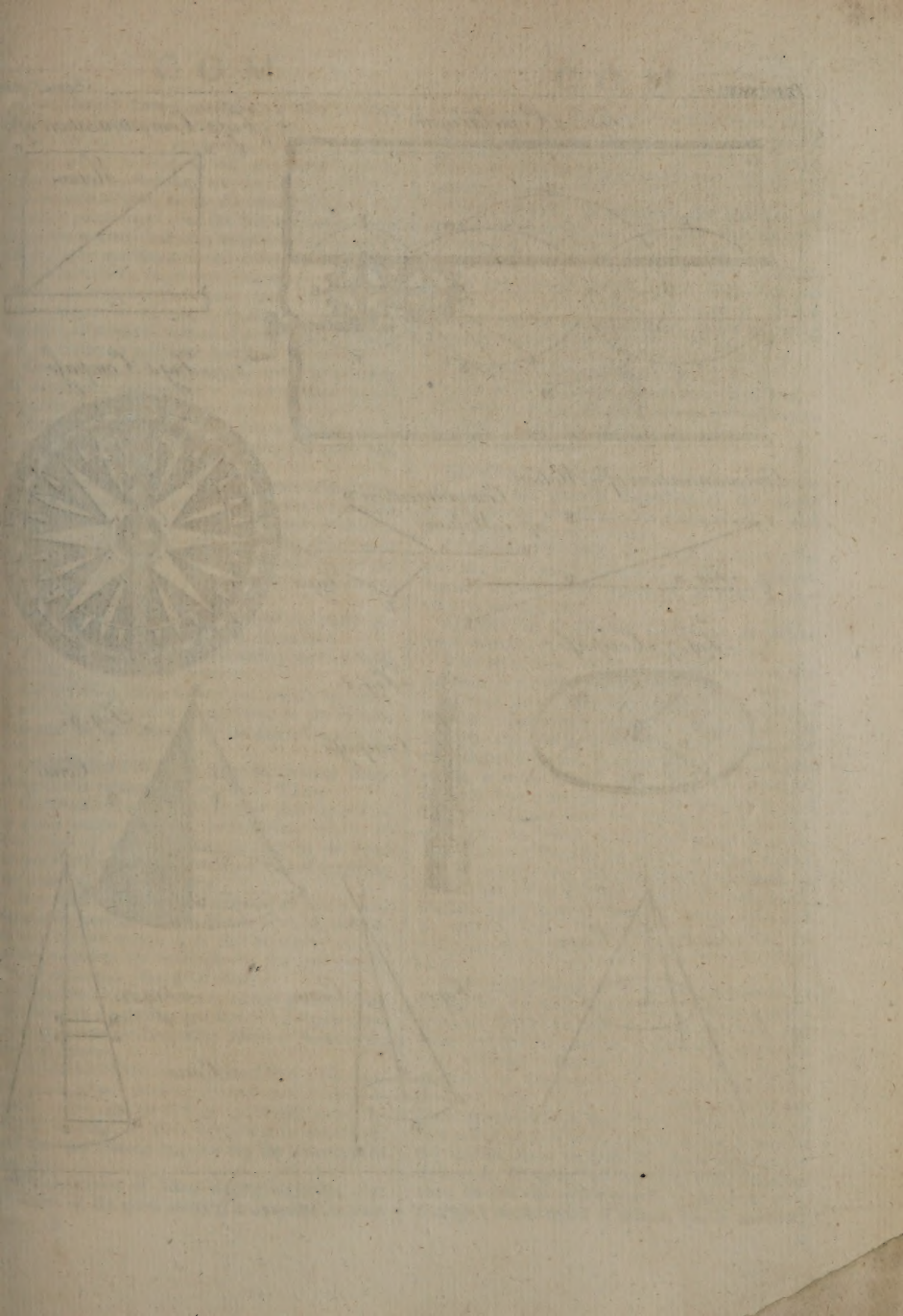


Fig. 1. 2. Cometarium

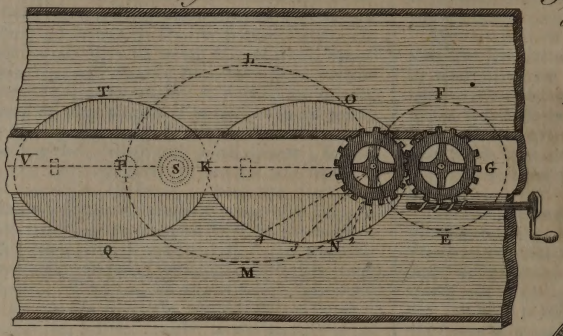


Fig 3. Communication of Motion

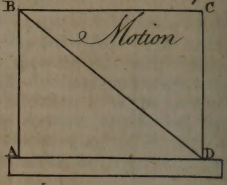


Fig. 6. Compafs

Communication of Motion

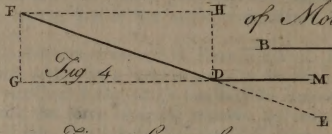


Fig 4

Communication of Motion

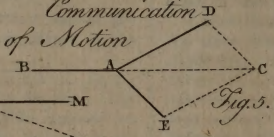


Fig 5.

Fig. 7. Compafs

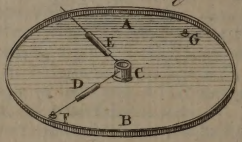


Fig. 8.

Compafs

Fig. 9.

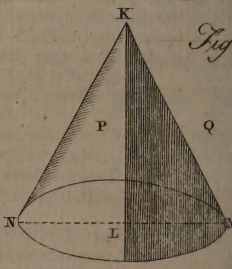


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Fig. 10.

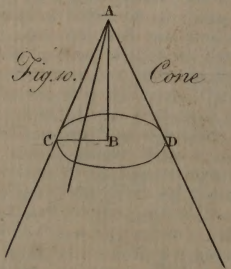

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Fig. 11.

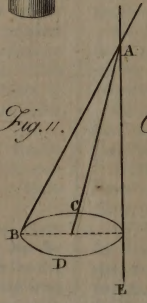

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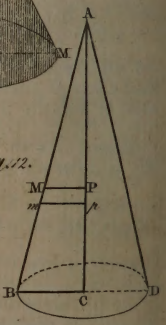
Fig. 12.



Cone

or punishment from a greater to a less; as when death is commuted for banishment, &c.

COMPACT, in physiology, is said of bodies which are of a close, dense, and heavy texture, with few pores, and they very small.

COMPANION, in naval architecture, a sort of wooden porch raised over the stair-case which leads from the quarter-deck of a merchant-ship down to the cabin or apartment of the master. See CABIN.

COMPANY, in general, denotes a number of people met together in the same place, and about the same design. With respect, however, to matters of pleasure or division, instead of company, we make use of the terms party, or match.

COMPANY, in a commercial sense, is a society of merchants, mechanics, or other traders, joined together in one common interest.

COMPANY, in military affairs, a small body of foot, commanded by a captain, who has under him a lieutenant and ensign.

The number of centinels, or private soldiers in a company, may be from 50 to 80; and a battalion consists of thirteen such companies, one of which is always grenadiers, and posted on the right: next them stand the eldest company, and on the left the second company; the youngest one being always posted in the center.

Companies not incorporated into regiments are called irregulars, or independent companies.

Rule of COMPANY, in arithmetic, the same with fellowship. See FELLOWSHIP.

COMPARATES, *Comparata*, among logicians, denote the terms of a comparison, or the subjects compared to each other. See the article COMPARISON.

COMPARATIVE, in general, denotes something that is compared to another. Thus,

COMPARATIVE ANATOMY, is that branch of anatomy which considers the secondary objects, or the bodies of other animals; serving for the more accurate distinctions of several parts, and supplying the defect of human subjects.

It is otherwise called the anatomy of beasts, and sometimes zootomy; and stands in contradistinction to human anatomy, or that branch of the art which considers the human body, the primary object of anatomy. See ANATOMY.

COMPARATIVE DEGREE, among grammarians, that between the positive and superlative degrees, expressing any particular quality above or beneath the level of another.

COMPARISON, in a general sense, the consideration of the relation between two persons or things, when opposed and set against each other, by which we judge of their agreement or difference, and find out wherein the one has the advantage of the other.

COMPARISON of *Ideas*, among logicians, that operation of the mind whereby it compares its ideas one with another, in regard of extent, degree, time, place, or any other circumstance, and is the ground of relations. This is a faculty which the brutes seem not to have in any great degree. See IDEA and RELATION.

COMPARISON, in grammar, the inflection of the comparative degree. See the article COMPARATIVE.

COMPARISON, in rhetoric, a figure that illustrates and sets off one thing, by resembling and comparing it with another, to which it bears a manifest relation and resemblance, as the following figure in Shakespear:

"She never told her love,
"But let Concealment, like a worm in th' bud,
"Feed on her damask cheek: She pined in thought,
"And sat, like Patience on a monument,
"Smiling at Grief."

COMPARTITION, in architecture, denotes the useful and graceful disposition of the whole ground-plot of an edifice, into rooms of office, and of reception or entertainment.

COMPARTMENT, or COMPARTIMENT, in general, is a design composed of several different figures, disposed with symmetry, to adorn a parterre, a ceiling, &c.

COMPASS, or *Mariners* COMPASS, an instrument whereby the ship's course is determined.

This instrument, which is a representation of the horizon, is a circle divided into 32 equal parts, by right lines drawn from the center to the circumference, called points, or rumbs, being also divided into 360 equal parts, or degrees; and consequently the distance between, or angle formed by, any two rumbs, is equal to $11^{\circ}, 15'$. The four principal of these rumbs are called the cardinal points, and take their names from the places to which they tend, viz. that which extends itself under the meridian, pointing towards the north, is called north; and its opposite one, pointing towards the south, is called south; that which is towards the right-hand, the face being directed north, is termed east; and its opposite, west. The names of the others are compounded of those, according to their situation.

The compass being of the utmost consequence to navigation, it is reasonable to expect that the greatest attention should be used in its construction, and every attempt to improve it carefully examined, and, if proper, adopted. But so careless are the generality of commanders of this most useful instrument, that almost all the compasses used on board merchant-ships have their needles formed of two pieces of steel wire, each of which is bent in the middle, so as to form an obtuse angle; and their ends, being applied together, make an acute one; so that the whole represents the form of a lozenge; in the center of which, and of the card, is

is placed the braſs cap. Now, if we examine a number of theſe cards, we ſhall rarely, if ever, find them all in the ſame direction, but they will all vary more or leſs, not only with regard to the true direction, but from one another.

Theſe irregularities are owing to the ſtructure of the needle; for the wires of which it is compoſed are only hardened at the ends; now, if theſe ends are not equally hard, or if one end be hardened up higher than the other, when they come to be put together, in fixing them to the card, that end which is hardeſt will deſtroy much of the virtue of the other; by which means the hardeſt end will have the moſt power in directing the card, and conſequently make it vary toward its own direction: and, as the wires are diſpoſed in the form of a lozenge, theſe cards can have but little force, ſo that they will often, when drawn aſide, ſtand at the diſtance of ſeveral degrees on either ſide the point from whence they are drawn: for all magnetical bodies receive an additional ſtrength by being placed in the direction of the earth's magnetiſm, and act proportionably leſs vigorouſly when turned out of it: wherefore, when theſe kind of needles are drawn aſide from their true point, two of the parallel ſides of the lozenge will conſpire, more directly than before, with the earth's magnetiſm; and the other two will be leſs in that direction: by which means the two ſides will very much impede its return; and the two latter will have that impediment to overcome, as well as the friction, by their own force alone.

To remove theſe inconveniencies, ſome needles are made of one piece of ſteel, of a ſpring temper, and broad towards the ends, but tapering towards the middle, where a hole is made to receive the cap. At the ends they terminate in an angle, greater or leſs, according to the ſkill or fancy of the workman. Theſe needles, though infinitely preferable to the other, are, however, far from being perfect; for every needle of this form hath ſix poles inſtead of two, one at each end, two where it becomes tapering, and two at the hole in the middle: this is owing to their ſhape; for the middle part being very ſlender, it has not ſubſtance enough to conduct the magnetic ſtream quite through, from one end to the other: all theſe poles appear very diſtinctly, when examined with a glaſs that is ſprinkled over with magnetic ſand. This circumſtance, however, does not hinder the needle from pointing true; but as it has leſs force to move the card than when the magnetic ſtream moves in large curves from one end to the other, it is certainly an imperfection.

Theſe inconveniencies induced the ingenious Dr. Knight to contrive a new ſea-compaſs, which is now uſed on board all the ſhips of war. The needle in this inſtrument is quite ſtraight, and ſquare at the ends; and conſequently has only two poles, though about the hole in the middle, the curves are a little confuſed. Needles of this conſtruction, after vibrating a long time, will always point exactly in the ſame direction; and if drawn ever ſo little on one ſide, will return to it again, without any ſenſible difference. We may therefore conclude, that a regular parallelopiped is the beſt form for a needle, as well as the ſimpleſt, the holes for the caps being as ſmall as poſſible.

And as the weight ſhould be removed to the greateſt diſtance from the center of motion, a circle of braſs, of the ſame diameter of the card, may be added, which will ſerve alſo to ſupport the card, which may then be made of thin paper, without any thing to ſtiffen it. This ring being fixed below the card, and the needle above it, the center of gravity is placed low enough to admit of the cap being put under the needle, whereby the hole in the needle becomes neceſſary.

In order to render the above inſtructions more plain and eaſy to be underſtood, we have given a view of the ſeveral parts (Plate XXXVI.) where *fig.* 6. is the card, with the needle K L, and its cap M, fixed upon it, being one third of the diameter of the real card.

Fig. 7, is a perſpective view of the backſide of the card, where A B repreſents the turning down of the braſs edge, C the under part of the cap, D and E two ſliding weights to balance the card, and F, G, two ſcrews that fix the braſs edge, &c. to the needle.

Fig. 8, is the pedeſtal that ſupports the card, containing a ſewing-needle, fixed in two ſmall grooves to receive it, by means of the collet C, in the manner of a port-crayon. D, the ſtem, is filed into an octagon, that it may be the more eaſily unſcrewed.

Azimuth COMPASS. See the article AZIMUTH *Compaſs*.

COMPASS DIALS, are ſmall horizontal dials, fitted in braſs or ſilver boxes, for the pocket, to ſhew the hour of the day, by the direction of a needle, that indicates how to place them right, by turning the dial about till the cock or ſtyle ſtands directly over the needle, and points to the northward: but theſe can never be very exact, becauſe of the variations of the needle itſelf.

COMPASS-SAW. See the article SAW.

COMPASSES, or *Pair of* COMPASSES, a mathematical inſtrument for deſcribing circles, meaſuring figures, &c.

Beam COMPASSES conſiſt of a long branch, or beam, carrying two braſs curſors, the one fixed at one end, the other ſliding along the beam, with a ſcrew to faſten it on occaſion.

To the curſors may be ſcrewed points of any kind, whether ſteel, for pencils, or the like. It is uſed to draw large circles, to take great extents, &c.

Caliber COMPASSES. See CALIBER.

Clockmaker's COMPASSES are joined like the common

mon compaſſes, with a quadrant, or how, like the ſpring compaſſes; only of different uſe, ſerving here to keep the inſtrument firm at any opening. They are made very ſtrong, with the points of their legs of well tempered ſteel, as being uſed to draw lines on paſte-board or copper.

Cylindrical and Spherical COMPASSES, conſiſt of four branches, joined in a center, two of which are circular, and two flat, a little bent on the ends: their uſe is to take the diameter, thickneſs, or caliber, of round or cylindric bodies; ſuch as cannons, pipes, &c.

For the method of uſing them, ſee the article CALIBER *Compaſſes*.

Elliptic COMPASSES conſiſt of a croſs A B G H, (Plate XXXIV. *fig.* 4.) with grooves in it, and an index C E, which is faſtened to the croſs by means of dove-tails at the points C D, that ſlide in the grooves; ſo that when the index is turned about, the end E will deſcribe an ellipſis, which is the uſe of theſe compaſſes.

German COMPASSES have their legs a little bent outwards, towards the top; ſo that when ſhut, the points only meet.

Lapidary's COMPASSES are a piece of wood, in form of the ſhaft of a plane, cleft at top, as far as half its length: with this they meaſure the angles, &c. of jewels and precious ſtones, as they cut them.

There is in the cleft a little braſs rule, faſtened there at one end by a pin; but ſo that it may be moved in the manner of a braſs level: with this kind of ſquare they take the angles of the ſtones, laying them on the ſhaft as they cut them.

Proportional COMPASSES are ſuch as have two legs, but four points, which, when opened, are like a croſs, as not having the joint at the end of the legs like common compaſſes: ſome of theſe have fixed joints, others moveable ones; upon the legs of the latter of which are drawn the lines of chords, ſines, tangents, &c.

Their uſe is to divide lines and circles into equal parts; or to perform the operations of the ſector at one opening of them.

COMPENDIUM, in matters of literature, denotes much the ſame with epitome, or abridgement. See ABRIDGMENT.

COMPENSATION, in a general ſenſe, an action whereby any thing is admitted as an equivalent to another.

COMPENSATION, in the civil law, a ſort of right, whereby a debtor, ſued by his creditor for the payment of a debt, demands that the debt may be compenſated with what is owing him by the creditor, which in that caſe is equivalent to payment.

COMPLAINANT, in law, the ſame with plaintiff. See the article PLAINTIFF.

COMPLEMENT, in aſtronomy, is an arch of a circle, comprehended between the place of a ſtar above the horizon and the zenith, which is commonly called the ſtar's zenith diſtance, or complement of altitude.

COMPLEMENT *of the Courſe*, in navigation, is the number of points, or degrees, minutes, and ſeconds that the courſe wants of eight points, or 90 degrees.

COMPLEMENT, in geometry, is what remains of a quadrant of a circle, after ſome parts has been taken away; or it is that part which in any angle or arch of a circle is wanting to make it a quadrant or 90 degrees.

The ſine of the complement of any arch is called the co-ſine, and that of the tangent, the co-tangent, &c.

COMPLEMENT *of the Curtin*, in fortification, is that part of which makes the demigorge. See the articles CURTIN and DEMIGORGE.

COMPLEMENT *of the Line of Defence*, is the remainder of the line of defence, after the angle of the flank is taken off. See the articles ANGLE and DEFENCE.

COMPLEMENTS *in a Parallelogram*, are the two ſmaller parallelograms G A E, F C E, (Plate XXXIV. *fig.* 5.) made by drawing two right lines G E, and F E, through the point E, in the diagonal; and parallel to the ſides A B, B C, of a parallelogram A B C D.

COMPLEX *Ideas*, in logic, are ſuch as are compounded of ſeveral ſimple ones. See the articles TERM and IDEA.

COMPLEX *Propoſition* is either that which has at leaſt one of its terms complex, or ſuch as contains ſeveral members, as caſual propoſitions: or it is ſeveral ideas offering themſelves to our thoughts at once, whereby we are led to affirm the ſame thing of different objects, or different things of the ſame object. Thus, *God is infinitely wiſe, and infinitely powerful.* In like manner, in the propoſition, *Neither kings nor people are exempt from death.*

COMPLEX *Term*, in logic, is that which requires more than one word to ſignify one thing; or where one word implies ſeveral things.

COMPLEXUS, in anatomy, a broad and pretty long muſcle, lying along the back-part and ſide of the neck: it is fixed below to the vertebræ of the neck, and above to the upper tranſverſe line of the os occipitis. There is one of theſe on each ſide; and both acting together, they pull the head directly backwards; whereas, if only one acts, it draws the head obliquely back.

COMPLEXUS MINOR, in anatomy, a narrow, long, and ſlender muſcle, lying along the inſide of the neck, and otherwiſe called maſtoidæus lateralis. See the article MUSCLES.

COMPLICATION, in general, denotes the blending, or rather interweaving, of ſeveral different things together: thus a perſon afflicted with

several disorders at the same time, is said to labour under a complication of diseases.

COMPONED, COMPONE, or GOBONY, in heraldry, is said of a bordure made up of angular parts, or chequers, of two different colours.

COMPOSITE, in general, denotes something compounded, or made up of several others united together. Thus,

COMPOSITE NUMBERS is one that may be divided by some one less than the composite itself, but greater than unity, as 4, 6, 8, 9, 10, &c.

COMPOSITE ORDER, in architecture, the last of the five orders of columns; so called because its capital is composed out of those of the other columns, borrowing a quarter-round from the Tuscan and Doric, a row of the leaves from the Corinthian, and volutes from the Ionic. Its corniche has simple modillions or dentils. It is also called the Roman or Italic order, as having been invented by the Romans. By most authors it is ranked after the Corinthian, either as being the next richest, or the last invented.

Scamozzi, and after him M. le Clerc, make the column of this order nineteen modules and a half, being less by half a module than that of the Corinthian, as in effect the order is less delicate than the Corinthian. Vignola makes it twenty, which is the same with that of his Corinthian: but Serlio, who first formed it into an order by giving it a proper entablature and base, and after him M. Perrault, raise it still higher than the Corinthian. See ORDER.

For the parts of this order, see the articles BASE, CAPITAL, COLUMN, ENTABLATURE, FRIEZE, PEDESTAL, &c.

COMPOSITION, *Compositio*, in a general sense, the uniting or putting together several things, so as to form one whole, called a compound.

COMPOSITION *of Ideas*, an act of the mind, whereby it unites several simple ideas into one conception, or complex idea.

COMPOSITION, in grammar, the joining of two words together; or prefixing a particle to another word, to augment, diminish, or change its signification. See the article WORD.

COMPOSITION, in logic, a method of reasoning, whereby we proceed from some general self-evident truth, to other particular and singular ones.

COMPOSITION, in music, the art of disposing musical sounds into airs, songs, &c. either in one or more parts, to be sung by a voice, or played on instruments. See the articles MUSIC and SONG.

COMPOSITION, in oratory, the coherence and order of the parts of a discourse.

COMPOSITION, in painting, consists of two parts, invention and disposition; the first is the choice of the objects which are to enter into the composition of the subject the painter intends to execute, and is either simply historical or allegorical. The other very much contributes to the perfection and value of a piece of painting.

COMPOSITION, in commerce, a contract between an insolvent debtor and his creditors, whereby the latter accept of a part of the debt in compensation for the whole, and give a general acquittance accordingly.

COMPOSITION, in printing, commonly termed composing, the arranging of several types, or letters, in the composing stick, in order to form a line; and of several lines ranged in order in the galley, to make a page; and of several pages, to make a form.

COMPOSITION *of Motion*, or FORCE, in mechanism, is an assemblage of several directions of motion resulting from powers acting in different, though not in opposite lines.

The change of motion is proportionable to the moving force impressed, and is made according to the right line in which that force is impressed. It is well known, that if any force generate any motion, a double or triple force will generate twice or thrice as much. But the alteration in respect of the direction of the motion, is a compound affair.

Let A be a body (Plate XXXIV. *fig.* 6.) impelled in the direction CD, by a body C, with such force as shall cause it to be uniformly over the space AD, in a second of time: at the same instant, let it receive a stroke by another body F, in the direction FB, with such a force as shall cause it to pass over the space AB in the same time.

Now, it is evident, the body A cannot move in both these directions; and, therefore, will not move in either, but in a direction compounded of both, which may be thus demonstrated. Describe DE, parallel to FB; then, though the action of F prevents the body from proceeding in the right-line AD, yet it can no ways alter its velocity of approaching to the line DE, in the given time, by virtue of the force impressed by C. At the end, therefore, of a second of time, the body A will be somewhere in the line DE; by the same way of reasoning, it will, at the end of the same time, be found somewhere in the line BE, parallel to AD, and therefore in the concourse of both, in the point E. Its cause then, is the line AE, which, by the first law of motion, is a right line. See LAWS *of Motion*.

Hence appears the method of compounding a direct force AE, out of any oblique force AD and DE; and, on the contrary, of resolving any direct force AE into two other oblique forces, by the two sides of a parallelogram; for the direct force will be represented by the diagonal, and the oblique by the sides AD and DE. The truth of this theory may be proved by experiment in the following manner.

Let the body A be drawn with a weight of three ounces in the direction AD, and by another of two ounces in the direction AB; then make AD to AB

AB as three to two, and compleat the parallellogram ADBE, and draw the diagonal (as in Plate XXXIV. *fig.* 7.) AE, which will measure four upon the same scale, (when the angle DAB is of a certain magnitude) which shews the body A in the same circumstance, as if it had been drawn by a four ounce weight in the direction AE; and this is proved true, by causing a body G of four ounces to draw the body A the contrary way, viz. from A to G; for then the body A will be at rest, or in equilibrio with all the forces.

COMPOSITION *of Proportion.* See PROPORTION.

COMPOST, in husbandry and gardening, several sorts of soils, or earthy matter, mixed together, in order to make a manure for assisting the natural earth in the work of vegetation, by way of amendment or improvement.

Composts are various, and ought to be different, according to the different nature or the quality of the soils which they are designed to meliorate, and according as the land is either light, sandy, loose, heavy, clayey, or cloddy. A light, loose land requires a compost of a heavy nature, as the scouring of deep ditches, ponds, &c. so, on the other hand, land that is heavy, clayey, or cloddy, requires a compost of a more sprightly and fiery nature, that will insinuate itself into the lumpish clods, which, if they are not thus managed, would very much obstruct the work of vegetation. See CLAY, &c.

The great use of composts is for such plants as are preserved in pots, or tubs; or sometimes it is used for small beds, or borders of flower-gardens: but it is too expensive to make composts for large gardens, where a great quantity of soil is required. In making of composts, great care should be had that the several parts are properly mixed together, and not to have too much of any one sort thrown together.

COMPOSTO, in music, means compounded or doubled, as a fifteenth is an octave doubled, or an octave is compounded of a fifth and a fourth.

COMPOUND, in a general sense, an appellation given to whatever is composed or made up of different things: thus we say, a compound word, compound sound, compound taste, compound force, &c. See the articles WORD, SOUND, &c.

COMPOUND FLOWER, one consisting of several distinct lesser flowers, or corollulæ, each furnished with a style, stamina, &c. See FLOWER.

The corollulæ are of two kinds, viz. tubulated and ligulated: the tubulated ones are always furnished with a campanulated limb, divided into four or five segments; whereas the ligulated corollulæ have only a flat, linear limb, terminated by a single point, or by a broader extremity, divided into three or five segments.

The plants with compound flowers are extremely numerous, forming a class by themselves, called by Linnæus, syngenesia. See the article SYNGENESIA.

COMPOUND-INTEREST. See the article INTEREST.

COMPOUND-MOTION, is that which is produced by several forces conspiring together in such a manner, that the direction of one is not contrary to the direction of the other; as when the radius of a circle moves about the center at the same time a point be conceived to go forwards along it. See COMPOSITION *of Motion.*

COMPOUND NUMBERS, PENDULUM, QUANTITIES, RATIO, &c. See NUMBERS, PENDULUMS, &c.

COMPOUNDER, in general, denotes one who compounds several things together.

COMPREHENSION, in logic, the same with apprehension. See APPREHENSION.

COMPREHENSION, or SYNECDOCHE, a trope or figure in rhetoric, which puts the name of the whole for a part, or of a part for the whole; a general for a particular of the same kind; or a particular for a general. By this trope a round and certain number is often set down for an uncertain one.

COMPRESS, in surgery, a bolster of soft linen cloth, folded in several doubles, frequently applied to cover a plaster, in order not only to preserve the part from the external air, but also the better to retain the dressings or medicines.

COMPRESSED LEAF, among botanists, one with a mark or impression on both sides. See LEAF.

COMPRESSOR, in anatomy, a muscle of the face, more usually known by the name of elevator alæ nasi.

COMPROMISE, a treaty, or contract, whereby two contending parties establish one or more arbitrators, to judge of and terminate their difference in an amicable way.

COMPTROLLER, or CONTROLLER. See the article CONTROLLER.

COMPUNCTION, in theology, an inward grief of mind for having offended God.

COMPURGATOR, in law, a person that by oath justifies or clears another's innocence.

COMPUTATION, in a general sense, the manner of estimating time, weights, measure, monies, or quantities of any kind.

COMPUTATION *in Mathematics*, is used in the same sense as calculation. See CALCULATION.

CONARION, or CONOIDES, a name for the pineal gland, a small gland about the bigness of a pea, placed in the upper part of that hole in the third ventricle of the brain, called the anus, and tied by some fibres to the nates. See BRAIN.

CONATUS, *in a Body of Motion*, is that dispos-

tion

tion or aptitude to go on in a right line, if not prevented by other causes, the same as attraction and gravitation without motion.

CONATUS is likewise a term used in mathematics to imply the endeavour any natural body that moves circular has to fly off, or recede from the center of its motion.

CONCAVE, or CONCAVITY, are terms used to signify the hollowness of any thing.

CONCAVE GLASS, or LENS, is one that is flat on one side and ground hollow on the other, but usually spherical. This by some is called a plano concave, and if this be concave or hollow on both sides it is called a double concave.

An object seen through a concave glass, or lens, appears nearer, smaller, and less bright than with the naked eye.

Thus, let A B, (Plate XXXIV. *fig.* 8.) be the object, C D the pupil of an eye, and E F the lens. Now, as it is the property of a lens, of this form, to render diverging rays more so, and converging ones less so, the diverging rays G H, G I, proceeding from the point G, will be made to diverge more, and so to enter the eye, as from some nearer point *g*; and the rays A H, B I, which converge, will be made to converge less, and to enter the eye sooner as from the points *a* and *b*; wherefore the object will appear in the situation *a*, *g*, *b*, less and nearer than without the lens.

But as the rays which proceed from G, are rendered more diverging, some of them will be made to pass by the pupil of the eye, which otherwise would have entered it, and therefore each point of the object will appear less bright. See FOCUS, LENS, and MIRROR.

CONCENTRATION, in general, signifies the bringing things nearer a center. Hence the particles of salt, in sea-water, are said to be concentrated; that is, brought nearer each other, by evaporating the watery part: thus, also, wine is said to be concentrated, when its watery parts are separated in form of ice by frost.

CONCENTRIC, in mathematics, something that has the same common center with another: it stands in opposition to excentric.

CONCEPTACULUM, among botanists, a kind of pericarpium, composed of soft and less rigid valves, and containing only one cavity.

CONCEPTION, among physicians, &c. denotes the first formation of an embryo in the womb of its parent, who from that time becomes pregnant. See GENERATION and PREGNANCY.

Immaculate CONCEPTION, a festival in the Romish church, observed on the 8th of December, in commemoration of the holy virgin's having been conceived and born immaculate, or without original sin.

CONCEPTION *of our Lady*, a religious order in Portugual, founded in the XVth century.

CONCEPTION, in logic, the same with apprehension. See APPREHENSION.

CONCERT, or CONCERTO, in music, a number or company of musicians, playing or singing the same piece of music or song at the same time.

CONCERTANTE, those parts of a piece of music that sing or play throughout the whole piece, either alone, or accompanied, to distinguish those parts that play now and then in particular places.

CONCERTATO intimates the piece of music to be composed in such a manner, as that all the parts may have their recitatives, be it for two, three, four, or more voices or instruments.

CONCERTO GROSSI, the grand chorus of a concert, or those places where all the several parts perform or play together.

CONCESSI, in law, a term frequently used in conveyances. Its effect is to create a covenant, as *dedi* does a warranty.

CONCESSION, in rhetoric, a figure, whereby something is freely allowed, that yet might bear dispute; to obtain something that one would have granted to him, and which he thinks cannot fairly be denied, as in the following concession of Dido, in Virgil:

"The nuptials he disclaims, I urge no more;
"Let him pursue the promised Latian shore.
"A short delay is all I ask him now;
"A pause of grief, an interval from woe."

CONCHA, a genus of bivalve shells, the animal inhabiting which is called tethys. See the article TETHYS.

CONCHA, in anatomy, the larger cavity of the external ear, situated before the meatus auditorius, or passage into the internal ear.

CONCHOID, or CONCHILIS, in geometry, a curve line, which always approaches nearer a straight line, to which it is inclined, but never meets it.

It is described thus: draw a right line B D (Plate XXXIV. *fig.* 9.) and another A C, perpendicular to it to E; draw any number of right lines, as C M, C M, cutting B D in Q; make Q M = Q N = A E = E F; the curve wherein the points M, M, are found, is the *conchilis*, or *conchois prima*; so called by its inventor Nicomedes. The others, wherein the points N, N, are found, is the *conchois secunda*; the right line B D the rule, the point C the pole. The inventor also contrived an instrument, whereby the first conchois may be described mechanically: thus, in the rule A D, (*fig.* 10.) is a channel or groove cut, so as a smooth nail, firmly fixed in the moveable rule C B, in the point F, may slide freely within it: into the rule E G is fixed another nail in K, for the moveable rule C B to slide upon.

If then the rule B C so moved, as that the nail F passes along the canal A D, the style or point in C will describe the first conchoid.

Now let A P = *x*, A E = *a*, P E = M R = *a* − *x*;

$= x$; wherefore as x increaſes, $a - x$ or MR will decreaſe, and therefore the curve continually approaches nearer to the rule BD.

In the ſame manner it appears that the right line NO muſt continually decreaſe, and therefore that the ſecond conchoid alſo muſt continually approach nearer the rule.

Now as between each conchoid and the right line BD, there will ſtill be the right line QM or QN, equal to AE; neither of the conchoids can concur with the right line BD, conſequently D is an aſymptote of each conchoid.

Put $b = CE$, $a = EA = MQ$, $CQ = x$, $MR = y$; then by the ſimilar triangles CEQ, QRM, we have $CE : CQ :: MR : MQ$, that is, $b : x :: y : a$, whence $ba = xy$.

Sir Iſaac Newton, in the latter part of his Univerſal Arithmetic, tells us, that the conchoid was uſed by Archimides, and other ancients, in the conſtruction of ſolid problems; and he himſelf prefers it before other curves, or even the conic ſections, in the conſtruction of cubic and biquadratic equations, on account of its ſimplicity and eaſy deſcription, ſhewing therein the manner of their conſtruction by help of it.

CONCHYLIA, a general name for all kinds of petrified ſhells, as limpets, cochlea, nautili, conchæ, lepades, &c.

CONCINNOUS Intervals, in muſic, are ſuch as are fit for muſic, next to, and in combination with, concords; being neither very agreeable nor diſagreeable in themſelves, but having a good effect, as by their oppoſition they heighten the more eſſential principles of pleaſure; as by their mixture and combination with them, they produce a variety neceſſary to our being better pleaſed.

Concinnous System, in muſic. A ſyſtem is ſaid to be concinnous, when its parts, conſidered as ſimple intervals, are concinnous; and are beſides placed in ſuch an order between the extremities, as that the ſucceſſion of ſounds, from one extreme to the other, may have an agreeable effect.

CONCLAVE, the place in which the cardinals of the Romiſh church meet, and are ſhut up, in order to the election of a pope.

Conclave is alſo uſed for the aſſembly or meeting of the cardinals ſhut up, for the election of a pope.

CONCLUSION, in logic, the conſequence or judgment drawn from what was aſſerted in the premiſes; or the previous judgments in reaſoning, gained from combining the extreme ideas between themſelves. See the article Syllogysm.

CONCOCTION, in medicine, the change which the food undergoes in the ſtomach, &c. to become chyle. See Chyle, Chylification, and Digestion.

CONCOMITANT, in theology, ſomething that accompanies or goes along with another; as concomitant grace is that which God affords us, during the courſe of our actions, to enable us to perform them; and according to the Romiſh divines, to render them meritorious.

CONCORD, in grammar, that part of conſtruction called ſyntax, in which the words of a ſentence agree; that is, in which nouns are put in the ſame gender, number, and caſe; and verbs in the ſame number and perſon with nouns and pronouns.

Concord, in muſic, the relation of two ſounds that are always pleaſing to the ear, whether applied in conſonance or in ſucceſſion.

If two ſimple ſounds have ſuch a relation, or difference of tune, as that, when mixed together, they form a compound ſound, which agreeably affects the ear, that relation is denominated concord: and whatever two ſounds agree in conſonance, the ſame will follow each other agreeably, or be pleaſing in ſucceſſion. The reverſe of a concord is a diſcord, being all the relations or differences of tune that are grating to the ear.

Concord and harmony are, in fact, the ſame thing, though by cuſtom they are applied differently, harmony expreſſing the agreement of a greater number of ſounds than two in conſonance; beſides, harmony always implies conſonance; but concord is ſometimes applied to ſucceſſion, though never but when it will make a pleaſing conſonance: whence it is, that Dr. Holder, and ſome others, uſe the word conſonance for what is called concord.

Uniſonance being the relation of equality between the two ſounds, all uniſons are concords, in the firſt degree: but an interval, being a relation of inequality between two ſounds, becomes a concord or diſcord, according to the variety of that particular relation: Mr. Malcolm thinks, that as the word implies agreement, it is applicable to uniſon in the firſt degree.

The differences of tune take their riſe from the different proportions of the vibrations of a ſonorous body, that is, of the velocity of thoſe vibrations in their recourſes; the more frequent thoſe recourſes are, the more acute is the tune, *& vice verſa*. But the eſſential difference between concord and diſcord lies more remote: there does not appear any natural aptitude in two ſounds of a concord to give a pleaſing ſenſation, more than in two of a diſcord; theſe different effects muſt be reſolved into the divine will.

We know from experience what proportions of tune are pleaſing, and what not; and we know likewiſe, how to expreſs the difference of tune by the proportion of numbers; we know what is pleaſing, though we do not know why: for inſtance, we know that the ratio of 1 : 2 conſtitutes concord, and 6 : 7 diſcord; but on what original ſyſtem pleaſing or diſpleaſing ideas are connected with thoſe relations,

relations, and their proper influence upon one another, is entirely above our reach.

We know that the following ratio's of the lengths of chords are concord 2 : 1, 3 : 2, 4 : 3, 5 : 4, 6 : 5, 5 : 3, 8 : 5; that is, by taking any chord for a fundamental, repreſented by one, the following diviſions thereof will be all concords with the whole, as $\frac{1\,2\,3\,4\,5\,3\,5}{2.3.4.5.6.5.8}$. So that the characteriſtic of concords and diſcords muſt be looked for in theſe numbers, expreſſing the intervals of ſound: not abſtractly, but as exhibiting the number of vibrations.

Now uniſons are in the firſt degree of concord, or have the moſt perfect agreement in tune; and therefore have ſomething acceſſory to that agreement which is more or leſs to be found in every concord: but it is not true, that the nearer two ſounds approach to an equality of tune, the more agreement they have; therefore it is not in the equality or inequality of the numbers that this agreement conſiſts.

Farther, if we conſider the number of vibrations made in any given time by two chords of equal time, they are, on the principle already laid down, equal; and therefore the vibrations of the two chords commence together as frequently as poſſible; that is, they coincide at every vibration, in the frequency of which coincidence, and of the undulations of the air occaſioned thereby, it is that the difference of concord and diſcord muſt be ſought.

Now, the nearer the vibrations of two ſtrings approach to a coincidence as frequent as poſſible, the nearer they ſhould approach that condition, and conſequently the agreement of uniſons, as is confirmed from experience.

If we take the natural ſeries, 1, 2, 3, 4, 5, 6, and compare each number to the next, as expreſſing the number of vibrations of two chords in the ſame time, whoſe lengths are reciprocally as thoſe numbers; the rule will be found exact; for 1 : 2 is beſt, then 2 : 3; after 6 the conſonance is inſufferable, as the coincidences are too rare; though there are other ratios that are agreeable, beſides thoſe found in that continued order, namely, 3 : 5 and 5 : 8, which, with the preceding five, are all the concording intervals within, or leſs than an octave, or 1 : 2; that is, whoſe acuteſt term is greater than half the fundamental.

On this principle 3 : 5 will be preferable to 4 : 5, becauſe, being equal in the number of vibrations of the acuter term, there is an advantage on the ſide of the fundamental in the ratio 3 : 5, where the coincidence is made at every third vibration of the fundamental, and every fifth of the acute term: in like manner the ratios 5 : 8 is leſs perfect than 5 : 6; becauſe though the vibrations of each fundamental, that go to one coincidence, are equal, yet, in the ratio 5 : 6, the coincidence is at every ſixth of the acute term, and only at every eighth in the other.

Thus there is a rule for judging of the preference of concords from the coincidence of their vibrations, as in the following table.

Ratios, or Vibrations.				*Coincid.*
	Grave Term.		Acute Term.	
Uniſon	1	:	1	
Octave, 8ve,	2	:	1	60
Fifth, 5th.	3	:	2	30
Fourth, 4th.	4	:	3	20
Sixth, gr.	5	:	3	20
Third, gr.	5	:	4	15
Third, leſſer.	6	:	5	12
Sixth, leſſer,	8	:	5	12
	Grave Lengths.		Acute Lengths.	

Though this order be ſettled by reaſon, it is confirmed by the ear; ſo that, upon this foot, concords muſt be the more perfect, as they have the greater number of coincidences, with regard to the number of vibrations in both chords; and where the coincidences are equal, the preference will fall on that interval, whoſe acuteſt term has feweſt vibrations to each coincidence: which rule is, however, in ſome caſes contrary to experience; and yet is the only rule hitherto diſcovered.

F. Merſenne, it is true, after Kircher, gives another ſtandard for ſettling the comparative perfection of intervals, with regard to the agreement of their extremes in tune.

The perception of concordance, ſay they, is nothing but the comparing of two or more different motions, which in the ſame time affect the auditory nerve: now we cannot certainly judge of any conſonance till the air be as often ſtruck in the ſame time by two chords, as there are units in each member expreſſing the ratio of that concord; as for inſtance, we cannot perceive a fifth, till two vibrations of the one chord, and three of the other, are performed together, which chords are at length as 3 to 2: ſo that thoſe concords are moſt ſimple and agreeable, which are generated in the leaſt time; and thoſe, on the contrary, the moſt compound and grating, which are produced in the longeſt time.

For example, let 1, 2, 3, be the lengths of three chords; 1 : 2 is an octave; 2 : 3 a fifth; and 1 : 3 an octave and fifth compounded, or a twelfth. The vibrations of chords being reciprocally as their lengths, the chord 2 will vibrate once, while the chord 1 vibrates twice, and then exiſt an octave; but the twelfth does not yet exiſts, becauſe the chord 3 has not vibrated once, nor the chord 1 thrice, which is neceſſary to form a twelfth.

Again,

Again, to generate a fifth, the chord 2 muſt vibrate thrice, and the chord 3 twice; in which time the chord 1 will have vibrated 6 times; and thus the octave will be thrice produced, while the twelfth is only produced twice; the chord 2 uniting its vibrations ſooner with the chord 1, than with the chord 3; and they being ſooner conſonant than the chord 1 or 2 with that of 3.

But this rule, upon examining it by other inſtances, Mr. Malcolm has ſhewn to be defective, as it does not anſwer in all poſitions of the intervals with reſpect to each other; but in a certain order required: and there being no rule, as to the order, to make this ſtandard tally with experience in every caſe; we are at laſt left to determine the degrees of concord by experience and the ear.

So that the whole may be ſummed up in this definition: concord is the reſult of a frequent union, or coincidence of the vibrations of two ſonorous bodies, and conſequently of the undulating motions of the air, which, ariſing from theſe vibrations, are ſimilar and proportionable to them; which coincidence, the more frequent it is, with regard to the number of vibrations of both bodies, performed in the ſame time, cæteris paribus, the more perfect is that concord: till the unfrequency of the coincidence, in reſpect of one or both the motions, commence diſcord.

Mr. Carre, in the Memoirs of the Royal Academy, lays down a general propoſition to determine the proportion of cylinders that are to form the concords of muſic; namely, that the ſolid cylinders, whoſe ſounds produce thoſe concords, are in a triplicate and inverſe ratio of that of the numbers which denote the ſame concords.

For inſtance, ſuppoſe two cylinders, the diameters of whoſe baſes and lengths are as 3 to 2, their ſolidities will be in the ratio of 27 to 8, which is the triplicate ratio, or as the cube of 3 to that of 2; conſequently the ſounds of thoſe two cylinders will produce a fifth, as expreſſed by thoſe numbers; and that the biggeſt and longeſt will give the grave ſound, and the ſmalleſt the acute: and ſo of all the reſt.

Concords are divided into original, or ſimple and compound. A ſimple concord is that whoſe extremes are leſs remote than the ſum of any other two concords. A compound concord is equal to two or more concords.

Other muſical writers ſtate the diviſion in this manner; an octave is 1 : 2, and all the inferior concords above mentioned are ſimple ones: and all greater than an octave are compound concords; as conſiſting of, and being equal to, the ſum of one or more octaves, and ſome ſingle concord leſs than an octave; and are uſually, in practice, called ſimple concords.

As to the compoſition and relations of original concords, by applying to them the rules of the addition and ſubtraction of intervals, they will be divided into ſimple and compound, according to the more general motion: as,

5 : 6 a 3d leſs	4th	3d g. and 3d l.	of	5th 4th or 6th
4 : 5 a 3d gr.	6th leſs	4th and 3d l.		gr. 3d leſs or
3 : 4 a 4th	6th gr.	6th gr.		3d gr. 3d l. 4th.

The octave is not only the firſt concord in point of perfection, the agreement of whoſe extremes is greateſt, and the neareſt to uniſon; ſo that, when ſounded together, it is impoſſible to perceive two different ſounds; but it is likewiſe the greateſt interval of the ſeven original concords; and, as ſuch, contains all the leſſer, which derive their ſweetneſs from it, as they more or leſs directly riſe out of it, and which gradually decreaſe from the octave to the leſſer ſixth, having but a ſmall degree of concord.

The manner in which thoſe leſſer concords are found in the octave, ſhews their mutual dependences. For, taking an harmonical and arithmetical mean betwixt each extreme, and the moſt diſtant of the two means laſt found, to wit, betwixt the leſſer extreme and the firſt arithmetical mean, and betwixt the greater extreme and the firſt harmonical mean, we have all the leſſer concords. Thus, if betwixt 360 and 180, the extremes of the octave, you take an arithmetical mean, it is 270, and an harmonical one is 240. Then betwixt 360 the greateſt extreme, and 240 the harmonical mean, take an arithmetical mean, it is 300; and an harmonical mean is 288. Again, betwixt 180, the leſſer extreme of the octave, and 270 the firſt arithmetical mean, it is 225, and an harmonical one 216.

Thus you have a ſeries of all the concords, both aſcending towards acuteneſs from a common fundamental term 360, and deſcending towards gravity from a common acute term 180: which ſeries has this property, that taking the two extremes, and any other two at equal diſtances, theſe four will be geometrically proportional.

The octave, by immediate diviſion, becomes a fourth and fifth; the fifth again, by immediate diviſion, produces the two thirds; the two thirds are therefore found by diviſion, though not immediately. And the ſame is true of the two ſixths. Thus all the original concords ariſe from the diviſion of the octave; the fifths and fourths immediately, the thirds and ſixths mediately.

From the perfection of the octave, it may be doubled, tripled, &c. and yet preſerve a concord; that is, the ſum of two or more octaves is concord; though the more compound will be gradually leſs agreeable; but it is not ſo with any other concord leſs than octave, the doubles, &c. whereof are all diſcords.

Again,

Again, whatever ſound is concord to one extreme of the octave, is concord to the other alſo; and, if you add any other ſimple concord to an octave, it agrees to both its extremes, to the neareſt being a ſimple concord, and to the fartheſt a compound one.

The greateſt number of the vibrations of the fundamental, it is to be farther obſerved, cannot exceed five, or there is no concord where the fundamental makes more than five vibrations to one coincidence with the acute term. This progreſs of the concords may be carried on *in infinitum*, but the more compound, the leſs agreeable. A ſingle octave is better than a double one, and that than a triple one; and ſo of fifths and other concords. Three or four octaves is the greateſt length in common practice: the old ſcales went but to two; no voice or inſtrument can well reach above four.

CONCORDANCE, a ſort of dictionary of the Bible, explaining the words thereof in alphabetical order, with the ſeveral books, chapters, and verſes quoted, in which they are contained.

CONCORDANT Verses, are ſuch as have ſeveral words in common, but which, by the addition of other words, convey an oppoſite or at leaſt a very different meaning.

CONCRETE, in the ſchool-philoſophy, an aſſemblage or compound. See the article Compound.

Concrete, in natural philoſophy and chemiſtry, ſignifies a body made up of different principles, or any mixed body: thus a ſope is the factitious concrete, or a body mixed together by art; and antimony is a natural concrete, or a mixed body, compounded in the bowels of the earth.

Concrete, in logic, is uſed in contradiſtinction to abſtract; for example, when we conſider any quality, as whiteneſs, inherent in a ſubject, as, ſuppoſe, in ſnow; if we may ſay the ſnow is white, then we ſpeak of whiteneſs in the concrete: but if we conſider whiteneſs by itſelf, as a quality that may be in paper, in ivory, and in other things, as well as in ſnow, we are then ſaid to conſider, or to take it in the abſtract. See the article Abstract.

Concrete Numbers, are thoſe which are applied to expreſs or denote any particular ſubject, as two men, three pounds, two thirds of a ſhilling, &c, whereas if nothing be concreted with the number, it is taken abſtractly, or univerſally. Thus three ſignifies an aggregate of three units; let theſe units be men, pounds, or whatever elſe you pleaſe.

CONCRETION, the uniting together ſeveral ſmall particles of a natural body into ſenſible maſſes, or concretes, whereby it becomes ſo and ſo figured and determined, and is indued with ſuch and ſuch properties. See Concrete.

CONCUPISCENCE, according to divines, an irregular appetite, or luſt after carnal things, inherent in the nature of man ever ſince the fall.

CONCURRING, or Congruent Figures, in geometry, thoſe which being laid upon one another, exactly correſpond and cover each other, and therefore are equal.

CONDENSATION, the act whereby a body is rendered more denſe, compact, and heavy.

Hence condenſation ſtands oppoſed to dilatation, or rarefaction; which latter renders the body lighter and looſer, by ſetting the parts further aſunder; whereas the former brings them cloſer to each other, and increaſes their contact.

Condenſation is, by moſt writers, diſtinguiſhed from compreſſion, in regard the latter is performed by ſome external violence; whereas the former is the action of cold.

CONDENSER, a pneumatic engine, or ſyringe, whereby an uncommon quantity of air may be crowded into a given ſpace; ſo that ſometimes ten atmoſpheres, or ten times as much air as there is at the ſame time in the ſame ſpace, without the engine, may be thrown in by means of it, and its egreſs prevented by valves properly diſpoſed.

It conſiſts of a braſs cylinder wherein is a moveable piſton; which being drawn out, the air ruſhes into the cylinder through a hole provided on purpoſe; and when the piſton is again forced into the cylinder, the air is driven into the receiver through an orifice, furniſhed with a valve to hinder its getting out.

The receiver or veſſel containing the condenſed air, ſhould be made very ſtrong, to bear the force of the air's ſpring thus increaſed; for which reaſon they are generally made of braſs: its orifice is fitted with a female ſcrew, to receive the male ſcrew at the end of the condenſer.

If glaſs be uſed for a condenſer, it will not ſuffer ſo great a degree of condenſation; but the experiment will be more entertaining, ſince the ſubject may be viewed in the condenſed air.

CONDERS, a term uſed in the herring fiſhery, for people who ſtand on cliffs or eminences near the ſea coaſt, to direct the fiſhermen which way the ſhoal of herrings paſſes; their courſe being more conſpicuous to thoſe who ſtand on high cliffs aſhore, than to thoſe on board the veſſels.

CONDITION, in the civil law, a clauſe of obligation ſtipulated as an article of a treaty or contract.

Condition, in common law, a reſtriction annexed to an act, qualifying or ſuſpending the ſame, in rendering its effect precarious and uncertain.

CONDITIONAL, ſomething not abſolute but ſubject to conditions.

Conditional legacies are not due till the conditions are accompliſhed.

The ſeeds have been recommended by ſome as demulcent, paregoric, and antiphrodiſiac. Of their real qualities, little more is known with certainty, than that they are innocent to ſome kinds of birds. Mr. Ray ſays he found the crop of a thruſh full of hemlock ſeeds, even at the ſeaſon when corn was plentiful.

Botaniſts enumerate two or three other ſpecies of conium, which are natives of foreign countries.

CONJUGATE DIAMETER, or *Axis of an Ellipſis*, the ſhorteſt of the two diameters, or that biſecting the tranſverſe axis. See the article AXIS.

CONJUGATE HYPERBOLAS. If there be two oppoſite hyperbolas A M, *a m*, (Plate XXXVII. *fig.* 1.) whoſe principal axis is the line A *a*, and conjugate axis of the line B *b*; and if there be two other hyperbolas, whoſe principal axis is the line B *b*, and conjugate one the line A *a*; then theſe four hyperbolas are called conjugate hyperbolas; the two former oppoſite ones being conjugates to the latter.

CONJUGATION, in grammar, a regular diſtribution of the ſeveral inflexions of verbs in their different voices, moods, tenſes, numbers and perſons, ſo as to diſtinguiſh them from one another.

The Latins have four conjugations, diſtinguiſhed by the terminations of the infinitive *ā're*, *ē're*, *ĕre*, and *ī're*; the vowels before *re* of the infinitive in the firſt, ſecond, and fourth conjugations being long vowels, and that before *re* in the infinitive of the third being a ſhort one. See the article VOWEL.

The Engliſh have ſcarce any natural inflexions, deriving all their variations from additional particles, pronouns, &c. whence there is ſcarce any ſuch thing as ſtrict conjugations in that language.

The French grammarians reduce the number of conjugations in their language to that in the Latin, and theſe terminating in *er*, *re*, *ir*, and *oir*.

CONJUGATION, in anatomy, is applied to a pair of nerves ariſing together, and ſerving the ſame operation, ſenſation, and motion.

CONJUNCTION, in aſtronomy, the meeting of two ſtars or planets in the ſame degree of the zodiac.

This conjunction is either true, or apparent. The true conjunction is when a right line, drawn from the eye through the center of one of the bodies, would paſs through that of the other: in this caſe the bodies are in the ſame degree of longitude and latitude: and here the conjunction is alſo ſaid to be central, if the ſame line, continued from the two centers through the eye, do alſo paſs through the center of the earth.

Apparent conjunction is when the two bodies do not meet preciſely in the ſame point, but are joined with ſome latitude.

In this caſe a right line, drawn through the center of the two bodies, would not paſs through the center of the earth, but through the eye of the ſpectator: this conjunction is alſo called partile.

The moon is in conjunction with the ſun, when they meet in the ſame point of the ecliptic, which happens every month; and eclipſes of the ſun are always occaſioned by the conjunction of the ſun and moon in or near the nodes of the ecliptic.

In the revolution of Jupiter's ſatellites, there muſt be diſtinguiſhed two conjunctions with the planet; the one made beyond the planet in reſpect of the ſun, and in paſſing from the weſtern excurſion to the eaſtern, which is called the ſuperior conjunction; the other made on this ſide the planet, in paſſing from the eaſtern excurſion to the weſtern, and is called the inferior conjunction. That part of a ſatellite's orbit, comprehended between the two points of its eaſtern and weſtern excurſions, and where the ſuperior conjunction is made, may be called the ſuperior ſemi-circle, and the part where the lower conjunction is made the inferior ſemi-circle. If the planes of the ſatellites were parallel to the plane of their reſpective primary planet's orbit, theſe planes prolonged would paſs through the ſun; becauſe the plane of each planet's orbit paſſes through it, conſequently all the ſatellites would appear to move in a right line, in the direction of the planet's diameter, where it is interſected by its orbit; therefore, would never paſs above or under the planet's center, when in conjunction with it.

Another conſequence of this phenomenon is, ſuppoſing the planets and their ſatellites to have no light but what is reflected from the ſun to them; then the ſatellite paſſing before the planet's diſk, when in their inferior conjunction, muſt hide the ſun from ſuch of the planet's inhabitants who are under their path, and thereby cauſe an eclipſe of the ſun to thoſe inhabitants. And, when in their ſuperior conjunction they paſs behind the planet's diſk, they ceaſe to be enlightened by the ſun, and conſequently, being ſunk in the planet's ſhade, are not viſible while in that ſhade, or behind the planet's diſk, which forms an eclipſe of the ſatellite or moon.

CONJUNCTION, in grammar, an undeclinable word, or particle, which ſerves to join words and ſentences together, and thereby ſhews their relation or dependence one upon another. The conjunction, which is uſually placed laſt in the eight parts of ſpeech, is of great uſe to render the diſcourſe ſmooth and fluent, and ſerves many good purpoſes in the argumentative or narrative ſtyle; but ſhould ever be omitted where a perſon ſpeaks with emotion, as only ſerving to weaken and enervate it. Conjunctions are of ſeveral kinds.

Adverſative CONJUNCTIONS, ſuch as are reſtrictive, or expreſſive of contrarieties; as, *but*, *nevertheleſs*, *although*.

Causal CONJUNCTIONS, such as express the reason of something advanced; as, *for*, *because*, *seeing*, *inasmuch as*.

Conclusive CONJUNCTIONS, such as shew that a consequence is drawn; as, *of consequence*, *for which reason*, *but then*, *so that*.

Conditional CONJUNCTIONS, those that denote a condition; as, *on condition that*, *if*, *if not*, *in case of*, *provided that*.

Copulative CONJUNCTIONS, such as shew a comparison, or express a relation of union between two things; as, *and*, *only*, *as much as*, *in the same manner as*, *not only*, *inasmuch as*, *but also*, *neither more nor less*.

Continuative CONJUNCTIONS, such as denote a succession or continuation of the discourse; as, *whatever it be*, *even*, *in effect*.

Disjunctive CONJUNCTIONS, such as import a relation of separation or division; as, *neither*, *whether*, *or*.

Dubitative CONJUNCTIONS, such as express some doubt, or suspension of opinion; as, *if*, *that is to say*, *&c.*

CONJURATION, magic words, characters, or ceremonies, whereby evil spirits, tempests, &c. are supposed to be raised, or driven away.

CONNARUS, in botany, a genus of plants, whose flower consists of five lanceolated, erect, equal petals; and contains ten subulated erect filaments, topped with roundish antheræ.

The fruit is an oblong, gibbous, bivalvular capsule, of one cell, containing a large ovated seed.

CONNECTICUT, a British colony of North America, bounded by the Massachuset colony on the north-east; by the sea, on the south; and by New-York, on the west; being about one hundred miles in length, and eighty in breadth.

This colony constitutes a distinct government, of a different form from that of New-England.

CONNECTION, or CONNEXION, the relation whereby one thing adheres to, or depends upon, another. Such is the relation between Euclid's propositions, that the latter cannot subsist but by its connection with the former.

CONNECTION, or CONTINUITY, in the drama, consists in the joining of the several scenes together.

The connection is said to be observed, when the scenes of an act succeed one another immediately, and are so joined, as that the stage is never left empty.

CONNIVENT VALVES, in anatomy, those wrinkles, cellules, and vascules, which are found in the inside of the two great intestines, the ilium and jejunum.

The inner tunic of the guts, being longer than the middle or the outward tunic, does frequently wrinkle, or bag out, in many places, by which means the passage for the contents become straightened, and the matter through the guts then descends more slowly, so that the lacteals have the more time to imbibe the chyle.

CONNOISSEUR, a French word much used of late in English, to signify a person well versed in any thing: whence it is used for a critic, or a person who is a thorough judge of any subject.

CONOCARPUS, the button-tree, in botany, a plant which grows in all the islands of the West-Indies. It rises with a woody upright stem, about sixteen feet high, sending out many side branches, which also grow erect: these are furnished with spear-shaped leaves, having broad foot-stalks, and are placed alternate on the branches.

The flowers grow upon short branches, which arise from the wings of the leaves. These have three or four small leaves on their lower part under the flowers: each of these branches are terminated by six or eight conical heads of flowers, each coming out of a scaly covering. The flowers are small, of a red colour, having five erect subulated filaments, topped with globose antheræ, with a single style.

The fruit is conical and scaly, and contains a single naked seed.

CONOID, in geometry, is a solid body generated by the revolution of a conic section about its axis.

Elliptical CONOID, is a solid formed by the revolution of an ellipse about one of its diameters, and more generally called a spheroid. See SPHEROID.

Hyperbolical CONOID, is generated by the revolution of an hyperbola A C E (Plate XXXVII. *fig.* 2.) about its axis A D.

Example I. Let it be required to find the surface of an hyperbolic conoid, generated by the rotation of the hyperbola A C F about its axis A D.

Let E be the center of the hyperbola, and put A E, the semi-transverse diameter, equal to b, and A G, the semi-conjugate diameter, equal to a; also B C $= x$, and E B $= y$. Now because, from the nature of the curve, $\dot{x}\dot{x} = \frac{aa}{bb} \times \overline{yy - bb}$; therefore $2\dot{x}\dot{x} = \frac{aa}{bb} \times 2y\dot{y}$; whence $2bb\dot{x}\dot{x} = 2aay\dot{y}$, and $bb\dot{x}\dot{x} = aay\dot{y}$, and $\dot{x} = \frac{aay\dot{y}}{bb\dot{x}}$; whence $\dot{x}\dot{x} = \frac{a^4y^2\dot{y}^2}{b^4x^2}$: substituting this therefore in the general equation, $\dot{z} = \overline{\dot{x}\dot{x} + \dot{y}\dot{y}^2}^{\frac{1}{2}}$ in the room of $\dot{x}\dot{x}$, and we shall have $\overline{\frac{a^2y^2\dot{y}^2b^2}{b^4 \times yy - bb} + \dot{y}\dot{y}}^{\frac{1}{2}} = \frac{\overline{a^2y^2\dot{y}^2b^2 + b^4y^2\dot{y}^2 - b^6\dot{y}^2}^{\frac{1}{2}}}{\overline{b^4 \times yy - bb}^{\frac{1}{2}}} = \frac{\overline{a^2y^2 + b^2y^2 - b^4}^{\frac{1}{2}}}{\overline{b^2 \times yy - bb}^{\frac{1}{2}}} \times \dot{y} =$

Fig. 1. Conjugate

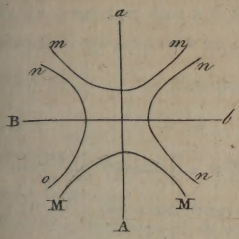
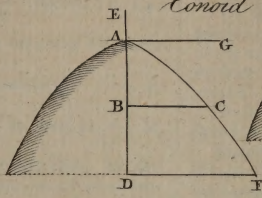


Fig. 2. Hyperbolic Conoid



Parabolic Conoid

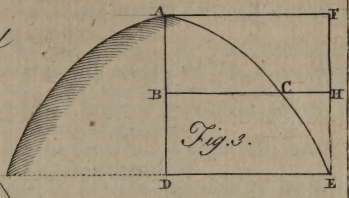


Fig. 3.

Consonant Strings

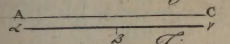


Fig. 4.

Fig. 5.

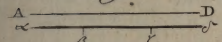


Fig. 6.

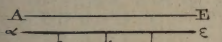


Fig. 7.

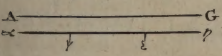


Fig. 8.

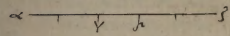


Fig. 9. Converging Rays

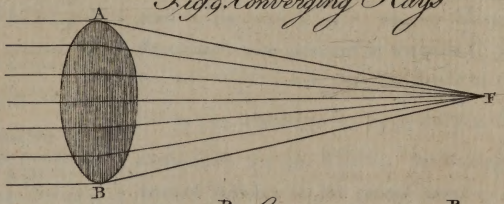
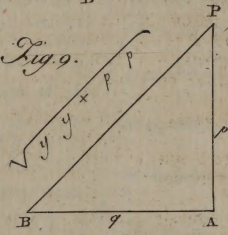


Fig. 9.



Construction of Equations

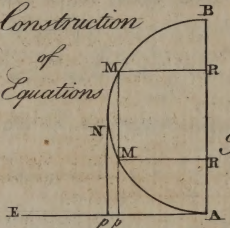


Fig. 10.

Fig. 11.

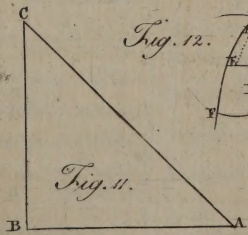


Fig. 12.

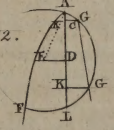
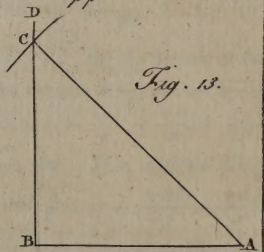
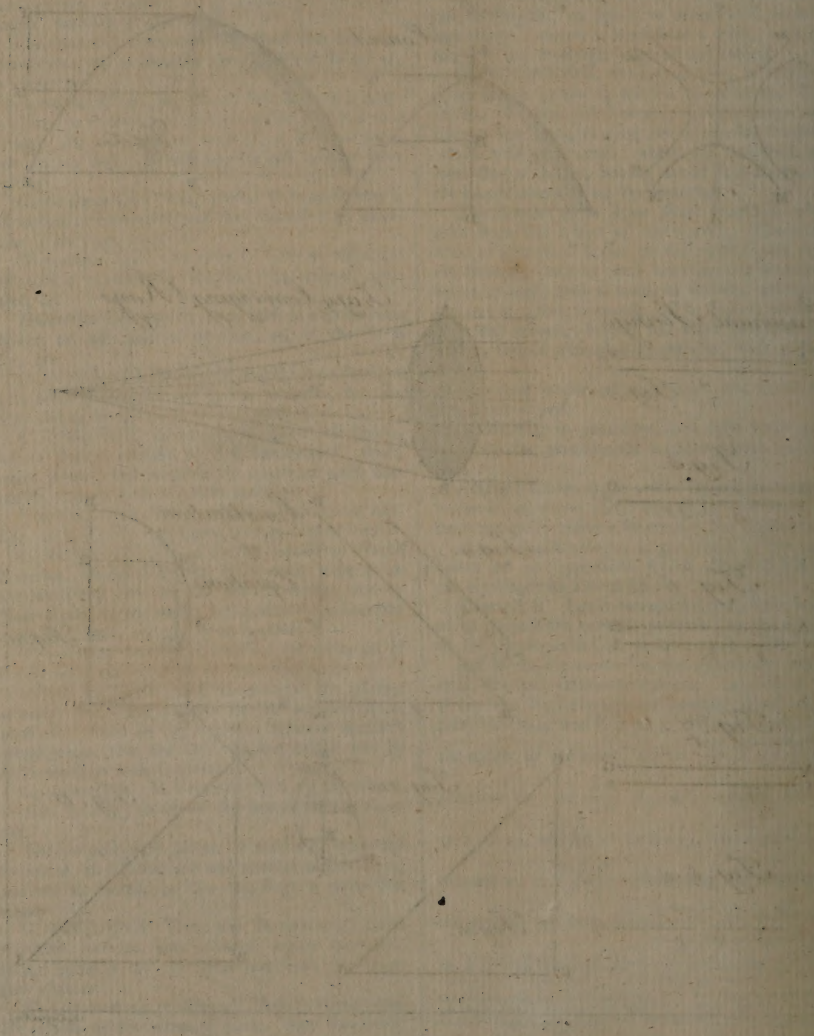


Fig. 13.





$\times \dot{y} = \frac{\dot{y}}{b} \overline{\frac{\dot{d}dyy - b^4}{yy - bb}}^{\frac{1}{2}}$, by ſubſtituting $\dot{d}\dot{d}$ in the room of $aa + bb$, for the fluxion of the curve.

Put $AD = r$, and the circumference generated by the point $= c$, then will the circumference generated by the point C be $= \frac{cx}{r}$ (for as $c : r :: x : \frac{cx}{r}$) $= \frac{c}{r} x$; but from the nature of the curve $x\dot{x} = \frac{aa}{bb} \times \overline{yy - bb}$; therefore $\dot{x} = \frac{a}{b} \times \overline{yy - bb}^{\frac{1}{2}}$; whence $\frac{c}{r} \dot{x}$ will be equal to $\frac{ca}{rb} \times \overline{yy - bb}^{\frac{1}{2}}$, the circumference deſcribed by the point C in the terms of the equation of the curve. This therefore being multiplied $\frac{\dot{y}}{b} \times \overline{\frac{\dot{d}dyy - b^4}{yy - bb}}^{\frac{1}{2}}$, the fluxion of the curve line, A C, will give $\frac{ca}{rb} \times \overline{yy - bb}^{\frac{1}{2}} \times \frac{\dot{y}}{b} \times \overline{\frac{\dot{d}^2y^2 - b^4}{yy - bb}}^{\frac{1}{2}} = \frac{cay}{rbb} \times \overline{\dot{d}dyy - b^4}^{\frac{1}{2}}$, for the fluxion of the ſurface generated by the curve line A C, about its axis A B.

Example II. Let it be required to find the value of the hyperbolic conoid formed by the rotation of the hyperbola A C F D, about its axis A D.

Having drawn an ordinate, as B C, put $DF = r$, $BC = y$, $AB = x$, $AD = a$, and $AE = 2b$, then will $ED = a + 2b$, and $EB = x + 2b$, and the area of the circle generated by the ordinate $BC = \frac{cyy}{2r}$; whence $\frac{cyy\dot{x}}{2r}$ will be the fluxion of the ſolid; and becauſe, from the nature of the hyperbola, as $ED \times AD : DF^2 :: EB \times AB : AC^2$; therefore $aa + 2ab : rr :: xx + 2bx : yy$; whence $yy = \frac{rrxx + 2brrx}{aa + 2ab}$. Putting therefore this laſt expreſſion in the room of yy, in the fluxion of the ſolid $\frac{cyy\dot{x}}{2r}$, we ſhall have $\frac{crxx\dot{x} + 2bcrx\dot{x}}{2aa + 4ab}$, whoſe fluent $\frac{crx^3}{6aa + 12ab} + \frac{bcrxx}{2aa + 4ab} = \frac{crx^3 + 3bcrx^2}{6aa + 12ab}$, for the value of the ſolid formed by the ſpace A B C; whence $\frac{aacr + 3abcr}{6a + 12b}$ will be the value of the whole ſolid; for when A B flows into, or becomes equal to A D, x will become equal to a. Whence it follows,

That the circumſcribed cylinder is to the inſcribed hyperbolic conoid, as $3a + 6b$ is to $a + 3b$, for the cylinder is $\frac{1}{2} acr$.

Parabolical CONOID is generated by the revolution of a parabola about its axis; and is ſomething like an half ſpheroid, only its ſides are ſomewhat ſtraighter.

To find the ſolid content, multiply the ſquare of the diameter of its baſe by ,7854, and multiply that product by half the height, and that laſt product will be the content required ſufficiently accurate for common practice.

To find the content of the lower fruſtum of a parabolical conoid, multiply the ſum of the ſquares of the leſſer and greater diameters by ,3927, and that product by the height of the fruſtum, and the laſt product is the content required.

By fluxions the ſurface of a parabolic conoid is found in the following manner.

Example I. Let it be required to find the ſurface of a parabolic conoid, generated by the rotation of the ſemi-parabola A D E, about its axis A D, (*fig.* 3.)

From any point B, let the ordinate B C be drawn paralled to D E; then put $AB = x$, $BC = y$, $DE = r$, and the circumference of the circle generated by the point $E = c$; whence $\frac{cy}{r}$ will be the circumference generated by the point C (for as $r : c :: y : \frac{cy}{r}$); but, from the nature of curve, $a\dot{x} = y\dot{y}$; whence $a\dot{x} = 2y\dot{y}$, and $\dot{x} = \frac{2y\dot{y}}{a}$; conſequently $\dot{x}\dot{x} = \frac{4yy\dot{y}\dot{y}}{aa}$. Subſtituting this quantity therefore in the general equation $\dot{z} = \overline{\dot{x}\dot{x} + \dot{y}\dot{y}}^{\frac{1}{2}}$ in the room of $\dot{x}\dot{x}$, and we ſhall have $\dot{z} = \overline{\frac{4yy\dot{y}\dot{y}}{aa}}^{\frac{1}{2}} + \dot{y}\dot{y} = \overline{\frac{4yy\dot{y}\dot{y} + aa\dot{y}\dot{y}}{aa}}^{\frac{1}{2}}$, which being multiplied by $\frac{cy}{r}$, the circumference generated by the point C, will give $\frac{cy}{r} \times \overline{\frac{4yy\dot{y}\dot{y} + aa\dot{y}\dot{y}}{aa}}^{\frac{1}{2}} = \frac{cy}{r} \times \overline{\frac{\dot{y}\dot{y}}{aa}}^{\frac{1}{2}} \times \overline{4yy + aa}^{\frac{1}{2}} = \frac{cy\dot{y}}{ar} \times \overline{4yy + aa}^{\frac{1}{2}} = \frac{c}{r} \times \frac{y\dot{y}}{a} \times \overline{4yy + aa}^{\frac{1}{2}}$, for the fluxion of the ſurface generated by the arch A C; but the ſquare root of $\overline{4yy + aa}$, is $a + \frac{2yy}{a} - \frac{2y^4}{a^3} + \frac{4y^6}{a^5} - \frac{10y^8}{a^7} + \frac{28y^{10}}{a^9}$, &c. This therefore being multiplied by $\frac{y\dot{y}}{a}$, will give $y\dot{y} + \frac{2y^3\dot{y}}{aa} - \frac{2y^5\dot{y}}{a^4} + \frac{4y^7\dot{y}}{a^6} - \frac{10y^9\dot{y}}{a^8} + \frac{28y^{11}\dot{y}}{a^{10}}$, whoſe fluent $\frac{yy}{2} + \frac{y^4}{2aa} - \frac{y^6}{3a^4} + \frac{y^8}{2a^6} - \frac{y^{10}}{a^8} + \frac{7y^{12}}{3a^{10}}$, &c. equal (by putting $a = 1$) to $\frac{c}{r} \times \frac{yy}{2} +$

$+\frac{y^4}{2}-\frac{y^6}{3}+\frac{y^8}{2}-\frac{y^{10}}{1}+\frac{7y^{12}}{3}$, &c. for the surface generated by the arch A C; but if we suppose D E $= b$, and imagine the ordinate B C to move in the direction A D, till it arrive at, or coincide with the ordinate D E, then y will become equal to b, and we shall have $\frac{c}{r}\times\frac{1}{2}bb+\frac{1}{4}b^4-\frac{1}{6}b^6+\frac{1}{8}b^8-b^{10}+\frac{7}{3}b^{12}$, for the surface of the whole parabolic conoid.

Example II. Let it be required to find the value of a parabolic conoid, generated by the revolution of the semi-parabola A C E D (Plate XXXVII. *fig.* 3.) about its axis A D.

From any point, as B, in the axis A D, let the ordinate B C be drawn parallel to the base D E; then put A B $= x$, B C $= y$, and D E $= r$, also A D $= a$, and the circumference described by the point E $= c$; whence to find the circumference generated by the ordinate B C, it will be as r : c :: y : $\frac{cy}{r}$ = to the circumference described by the point E; whence $\frac{cy}{2r}\times y=\frac{cyy}{2r}$, will be the arch of the same circle. This therefore being multiplied by $\dot{x}$, the fluxion of the abscisse, will give $\frac{cyy\dot{x}}{2r}=\frac{cx\dot{x}}{2r}$ (by putting x in the room of yy) because from the nature of the parabola, $1\dot{x}=yy$) for the fluxion of the solid generated by the space A B C, whose fluent $\frac{cxx}{4r}=\frac{cyyx}{4r}$ by putting yy in the room of x, equal to $\frac{carr}{4r}=\frac{1}{4}acr$ (by putting a in the room of x, and r in the room of y) will be the value of the solid generated by the whole parabolic space A D E; for if we imagine the ordinate B C in a flowing state, and to move till it arrives at, or coincides with the ordinate D E, then A B will become equal to A D, x will become equal to a, and y will become equal to r. Whence follows,

First, That the parabolic conoid is to the circumscribing cylinder as 1 to 2; for the cylinder is equal to $\frac{acr}{2}$.

Secondly, That the inscribed cone is to the cylinder as 1 to 3.

Thirdly, That the cylinder, the parabolic conoid, and the cone, are to each other as the numbers 3, $\frac{3}{2}$, 1.

CONOIDES, in anatomy, a gland found in the third ventricle of the brain, called pinealis, from its resemblance to a pine-apple. Descartes fixed the seat of the rational soul in this gland. See the article BRAIN.

CONSANGUINITY, the relation subsisting between persons of the same blood, or who are sprung from the same root.

CONSCIENCE, in ethics, a secret testimony of the soul, whereby it gives its approbation to things that are naturally good, and condemns those that are evil. When it judges of an action to be performed, it is called in the schools an antecedent conscience; and when it passes sentence on an action which is performed, it is called a subsequent conscience. When the mind is ignorant or uncertain about the motive of an action, or its tendency to good; or when there are several circumstances in the case, some of which being doubtful, render the mind dubious concerning the morality of an action, this is called a doubtful or scrupulous conscience; and if it mistakes concerning these, it is called an erroneous conscience. If the error or ignorance is involuntary or invincible, the action proceeding from that error, or from that ignorance, is reckoned innocent. But if they are the effect of negligence, or of affectation, the conduct flowing from such error is criminal. Not to follow one's conscience, though erroneous and ill-informed, Mr. Hutcheson likewise reckons criminal, as it is the guide of life, and to counteract it shews an incorrigible spirit; yet to follow an erroneous conscience is likewise criminal, if the error which misled the conscience was the effect of inattention, or of any criminal passion.

Some divines maintain that conscience is infallible, and hold it to be that immutable law by which God will judge men. They deny that the understanding can be the source of errors, and lay them all at the door of the will.

CONSCRIBED, a term used by some geometricians for circumscribed.

CONSCRIPT, *Conscriptus*, in Roman antiquity, an appellation given to the senators of Rome, who were called conscript-fathers, on account of their names being entered all in one register.

CONSECRATION, the act of devoting any thing to the service and worship of God. The Mosaical law ordained, that all the first-born, both of men and beast, should be sanctified or consecrated to God. We find also, that Joshua consecrated the Gibeonites, as Solomon and David did the Nethinims, to the service of the temple; and that the Hebrews sometimes consecrated their fields and cattle to the Lord, after which they were no longer in their power.

Among the ancient Christians, the consecration of churches was performed with a great deal of pious solemnity. In what manner it was done for the three first ages, is uncertain; the authentic accounts reaching no higher than the fourth, when, in the peaceable reign of Constantine, churches were every where built, and dedicated with great solemnity. Some think the consecration consisted in

in setting up the sign of the cross, or in placing a communion-table in the church; and others, that no more was done than preaching a panegyrical sermon in commemoration of the founder, and that then they proceeded to prayers, one of which was composed on purpose for the church to be consecrated. The Romanists have a great deal of pious foppery in the ceremonies of consecration; which they bestow on almost every thing, as bells, candles, books, water, oil, ashes, palms, swords, banners, pictures, crosses, agnus deis, roses, children's clouts, &c.

In England, churches have been always consecrated with particular ceremonies, the form of which was left to the discretion of the bishop. That observed by bishop Laud, in consecrating St. Catharine Creed church, in London, gave great offence.

CONSECRATION is particularly used for the benediction of the elements in the eucharist.

CONSECTARY, a deduction, or consequence, drawn from a preceding proposition. Some rather choose to call it a consequence, and others a corollary.

CONSENT *of Parts*, in the animal œconomy, an agreement or sympathy, whereby when one part is immediately affected, another, at a distance, becomes affected in the same manner.

CONSEQUENCE, in logic, the conclusion, or what results from reason or argument. See CONCLUSION.

The consequence is, that other proposition in which the extremes or premises of a syllogism are joined, or separated; and is gained from what was asserted in the premises.

This word, in a more restrained sense, is used for the relation or connection between two propositions, whereof one is inferred from the other.

CONSEQUENT, something deduced or gathered from a former argumentation. But, in a more precise sense, it is used for the proposition which contains the conclusion, considered in itself, without any regard to the antecedent: in which sense the consequent may be true, though the consequence be false. See the preceding article.

CONSEQUENT *of a Ratio*, in mathematics, the latter of the two terms of a ratio, or that to which the antecedent is compared; thus in m to n, n is the consequent, and m the antecedent. See the articles RATIO and PROPORTION.

CONSERVATOR, an officer ordained for the security and preservation of the privileges of some cities and communities, having a commission to judge of, and determine the differences among them.

CONSERVATOR *of the Peace*, in our ancient customs, a person who had a special charge to keep the king's peace.

CONSERVATORY, a term sometimes used for a green-house, or ice-house. See GREEN-HOUSE and ICE-HOUSE.

CONSERVE, in pharmacy, a form of medicine, contrived to preserve the flowers, herbs, roots, or fruits, of several simples, as near as possible to what they are when fresh gathered.

Conserves are made up by beating up the thing to be preserved with sugar, viz. a triple quantity thereof to those that are most moist, and a double quantity to those that are least so.

CONSIDERATION, in law, material causes or ground of a contract, without which the party contracting would not be bound.

CONSIGNMENT, in law, the depositing any sum of money, bills, papers, or commodities in good hands; either by appointment of a court of justice, in order to be delivered to the persons to whom they are adjudged; or voluntarily, in order to their being remitted to the persons they belong to, or sent to the places they are designed for.

CONSIGNMENT *of Goods*, in commerce, is the delivering or making them over to another: thus, goods are said to be consigned to a factor, when they are sent to him to be sold, &c. or when a factor sends back goods to his principal, they are said to be consigned to him.

CONSISTENT *Bodies*, a term frequently used by Mr. Boyle, to signify such bodies whose parts are firmly united together, so that they do not so easily slide over one another's surfaces as the parts of fluid bodies do.

CONSISTENTES, in church-history, an appellation given to such penitents as were permitted to assist at prayers, but not to partake of the Sacrament.

CONSISTORY, at Rome, is an ecclesiastical assembly held in the presence of the pope, for the reception of princes, or their ambassadors, for the canonization of saints, for the promotion of cardinals, and other important affairs.

CONSISTORIES, among the Jews, were courts of judicature, consisting of twenty-three persons, who were appointed to sit in judgment upon the lives and fortunes of the people, and decide all causes, a few only excepted.

CONSOLATION, a figure in rhetoric, wherein the orator endeavours to moderate the grief of another. A principal regard is always to be had to the circumstances and relations of the parties: thus, a superior may interpose his authority, and even chide: a wise man may dispute, sentences will become him: an inferior is to shew respect and affection, and even that he had this from some wise or learned person: and an equal is to appeal to their common friendship.

CONSOLE, in architecture, an ornament cut upon the key of an arch, which has a projecture, and, on occasion, serves to support little corniches, figures, busts, and vases. They are also called mutules and modillions, according to their form. Some

of them are ſtriated, others in form of cartouches, others have drops in form of triglyphs. Thoſe made at the end of a plank of wood, cut triangularwiſe, are called ancones. See ANCONE.

Mr. Le Clerc is of opinion, that a conſole ſhould always have ſomething maſſive to ſuſtain, and ſerve it as a reſt.

CONSONANCE, in muſic, is ordinarily uſed in the ſame ſenſe with concord, viz. for the union or agreement of two ſounds produced at the ſame time, the one grave and the other accute; which mingling in the air in a certain proportion, occaſions an accord agreeable to the ear.

Moſt authors confound conſonance and concord together, though ſome of the more accurate diſtinguiſh them, making conſonance a mere ſounding of two notes together, or in the ſame time, in contradiſtinction to the motion of thoſe ſounds in ſucceſſion, or one after the other. In effect, the two notions coincide; for two notes thus played in conſonance, conſtitute concord; and two notes that pleaſe the ear in conſonance, will pleaſe it in ſucceſſion.

Notes in conſonance conſtitute harmony, as notes in ſucceſſion conſtitute melody.

In the popular ſenſe, conſonances are either ſimple or compound. The moſt perfect is uniſon; though many authors, both among the ancients and moderns, diſcard it from the number of conſonances, as conceiving conſonances an agreeable mixture of grave and acute ſounds, and not a repetition of the ſame ſound. The firſt conſonance is the octave, then the fifths, the fourths, the thirds, and ſixths: the reſt are multiples, or repetitions of theſe.

CONSONANCE, in grammar, ſignifies a like cadence of words and periods, a fault to be avoided in Engliſh, though the ancients make a figure of them, which they call ὁμοιοτελευτον.

CONSONANT, a letter that cannot be ſounded without ſome ſingle or double vowel before or after it.

Conſonants are firſt divided into ſingle and double; the double are *x* and *z*, the reſt are all ſingle, and theſe are again divided into mutes and liquids; eleven mutes, *b, c, d, f, v, g, j, k, p, q, t*, and four liquids, *l, m, n, r*. But the moſt natural diviſion of conſonants is that of the Hebrew grammarians, who have been imitated by the grammarians of other oriental languages. Theſe divide the conſonants into five claſſes, with regard to the five principal organs of the voice, which all contribute, it is true, but one more notably than the reſt, to certain modifications which make five general kinds of conſonants. Each claſs comprehends ſeveral conſonants, which reſult from the different degrees of the ſame modifications, or from the different motions of the ſame organs: theſe organs are the throat, palate, tongue, teeth, lips; whence the five claſſes of conſonants are denominated guttural, palatal, lingual, dental, and labial.

The abbe Dangeau thinks the nature of the diviſion of the Hebrew grammarians very reaſonable, but he does not acquieſce in the diſtribution they have made of them. In order to find a natural and juſt diviſion of the conſonants, he obſerves, no regard muſt be had to the characters that repreſent them, nor any thing to be conſidered but their ſound, or the modification they give the ſound. On this principle the ſame author finds in the French five labial conſonants, *b, p, v, f, m*; five palatal ones, *d, f, g, k, n*; four hiſſers, *ſ, z, j, ch*; two liquids, *l* and *r*; two that mix with each other *ll, gn*; and the *h* aſpirate.

He adds, 1. That *m* and *n* are properly two naſal conſonants, the *m* ſounding like a *b* paſſed thro' the noſe, and the *n* like a *d* pronounced through the noſe.

2. That among the conſonants ſome are weak, others ſtrong; their difference conſiſting in this, the former are preceded by a ſmall emiſſion of the voice, that ſoftens them, which the latter have not: the weak are *b, c, d, g, z, j*; the ſtrong are *p, f, k, t, ſ, ch*: hence we may conclude, that the exceſs of conſonants in one language above another only conſiſts in this, that there are more modifications of ſound eſtabliſhed in the one than in the other: for all men having the ſame organs, may form the ſame modifications; ſo that it is entirely owing to cuſtom, nothing to nature, that the Engliſh have not the ϑ of the Greeks, the ע and ח of the Hebrews, the ſch of the Germans, the *gn* of the French, the *gl* of the Italians, and the *ll* of the Welch. Alſo that the Chineſe have no *r*, the Iroquois no labial conſonants, the Hurons abundance of aſpirates, and the Arabs and Georgians abundance of double conſonants. Laſtly, to find all the conſonants that may be formed in any language, there needs nothing but to obſerve all the modifications that the ſounds of ſpeech will admit of, by which we ſhall have all the conſonants practicable.

CONSONANT *Strings*, in muſic, are ſuch betwixt whoſe ſounds there is an union or agreement, or the one is an uniſon to the other. See CONSONANCE and CONCORD.

With regard to conſonant ſtrings, Dr. Wallis obſerves, it hath been long ſince obſerved, that if a viol or lute-ſtring be touched with the bow or hand, another ſtring on the ſame, or another inſtrument, not far from it, if an uniſon to it, or an octave, or the like, will at the ſame time tremble of its own accord; but Dr. Wallis further adds, that not the whole of that other ſtring doth thus tremble, but the ſeveral parts ſeverally, according as they are uniſons to the whole, or the parts of that ſtring ſo ſtruck; for inſtance, ſuppoſing A C, (Plate XXXVII. *fig.* 4.) an upper octave to α γ, and

therefore

therefore an uniſon to each half of it, ſtopped at β; now if A C be ſtruck, while $\alpha\gamma$ is open, the two halves of this latter, that is $\alpha\beta$ and $\beta\gamma$ will both tremble, but not the middle point at β; which will eaſily be obſerved, if a little bit of paper be lightly wrapped about the ſtring $\alpha\gamma$, and removed ſucceſſively from one end of the ſtring to the other: in like manner, if A D, *fig.* 5, be an upper twelfth to $\alpha\delta$, and conſequently an uniſon to its three parts $\alpha\beta$, $\beta\gamma$, and $\gamma\delta$, will ſeverally tremble, but not the points β, γ; which may be obſerved in like manner as the former: alſo, if A E, *fig.* 6, be a double octave to $\alpha\varepsilon$, the four quarters of this latter will tremble, when the former is ſtruck, but not the points β, γ, δ: ſo if A G, *fig.* 7, be a fifth to $\alpha\eta$, and conſequently each half of the former be ſtopped in D, an uniſon to each third part of the latter ſtopped in γ, ε, while that former is ſtruck, each part of this latter will tremble ſeverally, but not the points γ, ε, and while this latter is ſtruck, each part of the former will tremble, but not the point D; the like will hold in leſſer concords, but the leſs remarkably as the number of diviſions encreaſes. This phænomenon, as far as is known, was firſt diſcovered by Mr. William Noble, of Merton college, and after him by Mr. Thomas Pigot of Wadham college, and is now commonly know to muſicians: Dr. Wallis adds, that the ſame ſtring as $\alpha\gamma$, *fig.* 4. being ſtruck in the middle at β, each part being uniſon to the other, will give no diſtinct ſound at all, but a very confuſed one; as alſo if $\alpha\delta$, *fig.* 5, be ſtruck at β or γ, where one part is an octave to the other; and in like manner, if $\alpha\varepsilon$, *fig.* 6, be ſtruck at β or δ, the one part being a double octave to the other; and ſo if $\alpha\zeta$, *fig.* 8, be ſtruck in γ or δ, the one part being a fifth to the other, and thus in other like conſonant diviſions; but ſtill the leſs remarkably as the number of diviſions increaſes: this and the former phænomenon Dr. Wallis judges to depend upon one and the ſame cauſe, viz. the contemporary vibrations of the ſeveral uniſon parts, which make the one tremble at the motion of the other; but when ſtruck at the reſpective points of diviſions, the ſound is incongruous, becauſe the point that ſhould be at reſt is diſturbed: a lute or viol-ſtring will thus anſwer, not only to a conſonant ſtring on the ſame, or a neighbouring lute, or viol, but to a conſonant note in wind-inſtruments; which was particularly tried on a viol, anſwering to the conſonant notes on a chamber-organ, but not ſo remarkably to the wire-ſtrings of an harpſichord: wind-inſtruments communicate to the air as ſtrong a concuſſion, if not a ſtronger, than that of gut-ſtrings; and we feel the wainſcot-ſeats, on which we ſit or lean, to tremble conſtantly at certain notes on the organ or other wind inſtruments, as well as at the notes of a baſe-viol: Dr. Wallis was alſo told, that a thin, fine Venice glaſs was cracked with the ſtrong and laſting ſound of a trumpet or cornet, ſounding near it an uniſon or a conſonant note to that of the tone or ting of the glaſs, and he thinks it no ways improbable.

Queen CONSORT is ſaid in contradiſtinction to a ſovereign princeſs, or queen inveſted with ſupreme authority. See the article QUEEN.

CONSPIRACY, in law, ſignifies an agreement between two or more, falſely to indict, or procure to be indicted, an innocent perſon of felony.

CONSPIRATORS are, by ſtatute, defined to be ſuch as bind themſelves by oath, covenant, or other alliance, to aſſiſt one another, falſely and maliciouſly to indict perſons, or falſely to maintain pleas. Likewiſe thoſe that retain men in the countries with liveries or fees, in order to ſupport their malicious enterprizes, which extends as well to the takers as the givers, and to ſtewards and bailiffs of lords, who, by their office or power, take upon them to maintain quarrels.

Conſpirators in treaſon are thoſe that plot againſt the king and government.

CONSPIRING POWERS, in mechanics, thoſe acting in directions not oppoſite. See the article POWER.

CONSTABLE. Lord high conſtable, an ancient officer of the crowns both of England and France, whoſe authority was ſo very extenſive, that the office has been laid aſide in both kingdoms, except on particular occaſions, ſuch as the king's coronation. The conſtable of France had his perſon privileged, and, during the king's minority, was named next to the princes of the blood. The army obeyed him next the king: he managed all that belonged to war, either for puniſhment of delinquents, diſtribution of booty, ſurrender of places, &c. The juriſdiction and functions of this office are now in the marſhals of France.

The function of the conſtable of England conſiſted in the care of the common peace of the land, in deeds of arms and matters of war. By a law of Richard II. the conſtable of England has the determination of things concerning wars and blazonry of arms, which cannot be diſcuſſed by the common law. The firſt conſtable was created by the Conqueror: the office continued hereditary till the thirteenth of Henry VIII. when it was laid aſide, as being ſo powerful as to become troubleſome to the king. We have alſo conſtables denominated from particular places, as conſtables of the Tower, of Dover-caſtle, of Windſor-caſtle, of the caſtle of Caernarvon, and many other of the caſtles of Wales, whoſe office is the ſame with that of the caſtellani, or governors of caſtles.

From the lord-high conſtable are derived thoſe inferior ones, ſince called the conſtables of hundreds or franchiſes, who were firſt ordained in the thirteenth of Edward I. by the ſtatute of Wincheſter, which, for the conſervation of peace and view of armour,

armour, appointed that two conſtables ſhould be choſen in every hundred. Theſe are what we now call high-conſtables, on account that the increaſe of people and offences has made it neceſſary to appoint others under theſe, in every town, called petty-conſtables, who are of the like nature, though of inferior authority to the other. The high-conſtable over the whole hundred is uſually choſen and ſworn into his office by the juſtices of the peace, in their ſeſſions; and as to petty-conſtables in towns, villages, &c. the right of chooſing them belongs to the court-leet, though they may be elected by the pariſhioners. They are appointed yearly, and ought to be men of honeſty, knowledge, and ability; and if they refuſe to ſerve, or do not perform their duty, they may be bound over to the ſeſſions, and there indicted and fined.

CONSTAT, in law, a certificate that the clerk of the pipe and auditors of the exchequer grant at the requeſt of any perſon who intends to plead or move in that court for the diſcharge of any thing. A conſtat is ſuperior to an ordinary certificate, becauſe it contains nothing but what is evident on record.

CONSTELLATION, in aſtronomy, is a ſyſtem of ſeveral ſtars that are ſeen in the heavens near to one another.

The aſtronomer to avoid confuſion, and to be able to point out any one ſtar, without being allowed to give a particular name to each, divides them into ſeperate parcels, of which he will make a particular plan; and to each of theſe parcels he will aſſign a figure at pleaſure, ſuch as a ram, a bull, a dragon, &c. ſo that all the ſtars in each of the parcels drawn on the plan, may be incloſed in the deſigned figures, and correſpond to the different parts from whence they take their name.

For example. Having drawn a bull about a parcel of ſtars, that ſtar which falls in the eye is called the ſtar in the Bull's Eye; another which reſpects the tip of the horn, will be named the Bull's Horn. By this means, if any new phænomenon is ſeen in the heavens among the ſtars thus divided into parcels, it is directly known in what part of the heavens it is in, as in the horn, or towards the bull's head, &c.

A parcel of ſtars thus contained in an aſſigned figure is called a conſtellation. But we would adviſe our young aſtronomers, or ſuch who are making themſelves acquainted with the names of the ſtars, not to expect that they ſhall find any parcel of ſtars forming the figure from which they take their names, or have any likeneſs in many of theſe conſtellations, or rather in none but the triangles.

In practical geometry, when an exact plan of a piece of ground is to be drawn, the figure may be divided from each three objects into triangles, whoſe ſides are meaſured by an inſtrument, ſuch as a chain, and the triangles are joined together by the common ſides: in the ſame manner, the obſerver will imagine that each ſtar forms with any other two, a ſpheric triangle, whoſe ſides are arcs, on the concave ſphere, comprehended between theſe ſtars; and ſince the centre of theſe arcs are at his eye, he can meaſure them by the arc of an inſtrument of a circular form; whoſe radius is ſufficiently large, to diſtinguiſh degrees, minutes, and ſeconds.

Now having determined the arcs ſhewing the diſtances of each ſtar from two or three others, they may be put on a globe, on which may be drawn the figures of the conſtellations; or general and particular charts may be made of them, in the ſame manner, as on the terreſtrial globe all the points on the ſurface of the earth are drawn, whoſe reciprocal diſtances are known; or as the geographical charts are made.

As the earth intercepts from its inhabitants a part of the fixed ſtars, ſo the ancient aſtronomers divided that part of the heavens which they knew, into forty-eight principal conſtellations, viz. the Great Bear, Little Bear, Dragon, Cepheus, Caſſiopeia, Andromeda, Perſeus, Bootes, Northern Crown, Hercules, Harp, Swan, Serpentarius, Serpens, Vulpeculæ and Anſeris, Sagitta, Eagle and Antinous, Dolphin, Little Horſe, Pegaſus, Northern Triangle, Aries, Taurus, Gemini, Cancer, Leo, Virgo, Libra, Scorpio, Sagittarius, Capricorn, Aquarius, Piſces, Whale, Orion, Eridanus, Hare, Great Dog, Little Dog, Ship Argo, Hydra, Cup, Crow, Centaur, Wolf, Altar, Southern Crown, and Southern Fiſh.

Within the laſt three hundred years, navigators who had failed to countries unknown to the ancients, having diſcovered thoſe ſtars which are never ſeen in Europe, have formed them into twelve new conſtellations, viz. the Peacock, Crane, Toucan, Phenix, Gold Fiſh, Flying Fiſh, Hydrus, Camelion, Bee, Indian Bird, Southern Triangle, Indian, the Greyhounds, Lacenta, Monceros, &c.

The figures attributed to theſe new conſtellations had no other origin than the fancy of thoſe who named them. It is not ſo with thoſe of the ancients, which took their origin from the religious ceremonies of the Ethiopians, Egyptians, Phenicians and Caldeans. The Greeks adopted a part, and diſguiſed the reſt by ſubſtituting names and figures drawn from their fabulous hiſtory; this has been the ſubject of ſeveral learned diſſertations, which may be conſulted.

The venerable Bede, indeed, out of a vain zeal, inſtead of the names and figures of the twelve conſtellations, ſubſtituted thoſe of the twelve apoſtles; Julius Schillerius, in 1627, completed the reformation, and gave ſcripture-names to all the conſtellations in the heavens. But as theſe innovations could ſerve no purpoſe, but that of introducing quarrels into

into aſtronomy, the old conſtellations are ſtill retained, both becauſe better could not be ſubſtituted, and likewiſe to keep up the greater correſpondence and uniformity between the old aſtronomy and the new.

The diviſion of the ſtars by images and figures is of great antiquity, and ſeems to be as old as aſtronomy itſelf; for in the moſt ancient book of Job, Orion, Arcturus, and the Pleiades are mentioned; and we meet with the names of many of the conſtellations in the writings of the firſt poets Homer and Heſiod.

The hiſtory of each conſtellation, with the number of ſtars each contains, ſee under their reſpective names, likewiſe ſee CATALOGUE, ASTRONOMY, &c.

CONSTIPATION, in medicine, a hardneſs of the belly, with great coſtiveneſs.

CONSTITUENT PART, in phyſiology, an eſſential part in the compoſition of any thing, differing little from what is otherwiſe called element or principle.

CONSTITUTION, in matters of policy, ſignifies the form of government eſtabliſhed in any country or kingdom.

CONSTITUTION, in a phyſical ſenſe, is that particular diſpoſition of the human body, which reſults from the properties and mutual actions of the ſolids and fluids, and which renders them capable of exerciſing the functions proper and conformable to nature.

CONSTRICTOR, an appellation given to ſeveral muſcles, on account of their conſtringing or cloſing ſome of the orifices of the body. Thus,

CONSTRICTOR LABIORUM, called alſo orbicularis, becauſe its fibres are of an arched figure, is a muſcle which conſtitutes the very ſubſtance of the lips, and draws them up, as in kiſſing; whence it is alſo called baſiator and oſculatorius.

CONSTRICTOR NASI, a muſcle ariſing above the dentes inciſores of the upper jaw, and terminating in the alæ of the noſe. It is but ſingle, though Santorini will have it that it is double, and is not orbicular in human ſubjects, as in many of the quadrupeds. Properly ſpeaking, indeed, there is in the human frame no ſuch muſcle as the conſtrictor orbicularis of beaſts, but this ſerves in ſome degree to its office. The uſe is to draw the alæ downwards, and at the ſame time to draw the upper lip downwards, in which action it is very much aſſiſted by the conſtrictor of the lips.

CONSTRUCTION, in geometry, is drawing ſuch lines as are previouſly neceſſary for the making any demonſtration appear more plain and undeniable.

CONSTRUCTION *of Equations*, in algebra, is finding the unknown quantities, or the roots of an equation, either by ſtraight lines or curves; or it is the method of drawing a geometrical figure, whoſe properties ſhall expreſs the given equation, in order to demonſtrate the truth of it.

CONSTRUCTION *of ſimple Equations* is affected by revolving the fractions to which the unknown quantity is equal into proportional parts. Thus, if $\frac{ca}{b} = z$, then it will be as $b : c :: a : z$; whence z will be determined by finding a fourth proportional.

Suppoſe the equation $\frac{ab + mn}{r - s} = z$. The firſt thing to be done is to find a mean proportional between a and b, which ſuppoſe to be p; alſo another between m and n, which call q, then the equation will ſtand thus, $\frac{qq + pp}{r - s} = z$: which may be conſtructed thus. Let the baſe AB, (Plate XXXVII. *fig.* 9.) of the right angled triangles APB, be made equal to g, and the perpendicular AP equal to p; then will PB^2 be equal $qq + pp$; which, according to the equation is to be divided by $r - s$; therefore it will be as $r - s$: PB $(= \sqrt{qq + pp})$ :: PB : to a third proportionable, which will give z.

CONSTRUCTION *of quadratic Equations*. In order to render this ſort of conſtruction more eaſy to the young geometer, we adviſe that he would conſider well the nature of the ſecond order of curves which are made uſe of in conſtructing quadratic equations, and which he will find under the article curve; and then peruſe the following method, which is given by the ingenious Mr. Maclaurin in the latter part of his algebra.

The general equation expreſſing the nature of the lines of the ſecond order, having all its terms and coefficients, will be of this form;

$$\left.\begin{array}{l} y^2 + axy + cx^2 \\ \quad + by + dx \\ \quad\quad + e \end{array}\right\} = 0$$

where a, b, c, d, e, repreſent any given quantities with their proper ſigns prefixed to them.

If a quadratic equation is given, as $y^2 + py + q = 0$, and, by comparing it with the preceding, if you take the quantities a, b, c, d, e, and x ſuch that $ax + b = p$, and $cx^2 + dx + e = q$, then will the values of y in the firſt equation be equal to the values of it in the ſecond; and if the locus be deſcribed belonging to the firſt equation, the two values of the ordinate when $ax + b = p$ and $cx^2 + dx + e = q$, will be the two roots of the equation $y^2 + py + q = 0$.

And as four of the given quantities a, b, c, d, e, may be taken at pleaſure, and the fifth, with the abſciſſe x, determined, ſo that $ax + b$ may be ſtill equal to p, and $cx + dx + e = q$; hence there are innumerable ways of conſtructing the ſame equa-

always four affirmative roots on the right side of the axis, which the latter has sometimes on the right and sometimes on the left.

As to cubic equations, they are to be reduced to biquadratics, before they can be constructed by the same general rule; which is done by multiplying the equation proposed by its root z, whence arises a biquadratic equation, in which the last term or r is wanting; wherefore taking away the second term, and finding the centre E, the line E O is the radius of the circle; *viz.* when $ar = 0$; and the whole fifth term, in the new equation, arises from the taking away of the second term.

Example II. $z^3 - bzz + apz + aaq = 0$, which, multiplied into z, becomes $z^4 - bzzz + apz^2 + aazq = 0$; to take away the second term, let $x + \frac{1}{4}b = z$ and it will be,

$$\begin{aligned} x^4 + bx^3 + \tfrac{3}{8}bbxx + \tfrac{1}{16}b^3x + \tfrac{1}{256}b^4 &= +z^4. \\ -bx^3 - \tfrac{1}{2}bbxx - \tfrac{1}{16}b^3x - \tfrac{1}{64}b^4 &= -bz^3. \\ +apxx + \tfrac{1}{2}apbx + \tfrac{1}{16}apbb &= +appzz. \\ +aaqx + \tfrac{1}{4}aaqb &= +aaqz. \end{aligned}$$

In this new equation, the half coefficient of the third term divided by a, viz. $\frac{3bb}{16a} + \frac{1}{2}p$ is to be substituted for $\frac{1}{2}p$; and the half coefficient of the fourth term divided by aa, the square of the latus rectum, viz. $\frac{b^3}{16aa} + \frac{pb}{4a} + \frac{1}{2}q$ is instead of $\frac{1}{2}q$ in Cartes's construction, from whence the centre E is determined; then drawing a parallel to the axis, at the distance $\frac{1}{4}b$ to the left side, because $x + \frac{1}{4}b = z$, whose intersection with the parabola, let be O; a circle described from the centre E and with the radius E O will either cut or touch the parabola, in as many points as the equation hath true roots; which roots, or z are perpendiculars let fall from those points upon the parallel to the axis, the affirmative on the right side, and the negative on the left: if the third or fourth term, or both, be wanting in the equation, in investigating the central rule, there is no manner of difference at all to be observed; but the quantity p or q being wanting, those parts of the lines C D and D E, in some measure deduced from that quantity, will be wanting too; and we are to proceed with the remaining coefficients of the third and fourth terms in the new equation, according to the method prescribed in the preceding examples.

CONSTRUCTION, in grammar, the connecting the words of a sentence according to the rules of the language.

CONSUBSTANTIAL, among divines, a term denoting something of the same substance with another. Thus the orthodox believe the Son of God to be consubstantial with the Father.

CONSUBSTANTIATION, a tenet of the Romish and Lutheran churches with regard to the manner of the change made in the bread and wine in the eucharist.

CONSUL, the chief magistrate of the Roman commonwealth. They were two in number, chosen every year in the campus martius, by the people assembled in the comitia centuriata.

CONSUL, at present, is an officer established by virtue of a commission from the king and other princes, in all foreign countries of any considerable trade to facilitate and dispatch business, and protect the merchants of that nation.

CONSULATION, in law, a writ by which a cause being removed from the spiritual court to the king's court, is returned thither again; and the reason is, that if the judges of the king's court, by comparing the libel with the suggestion of the party, find the suggestion false or not proved, and on that account the cause to be wrongfully called from the ecclesiastiacal court, then upon this consultation or deliberation; they decree it to be returned.

CONSUMPTION, in medicine. See the article PATHISIS.

CONTACT, is when one line, plane, or body, is made to touch another; and the parts that thus touch, are called the points or places of contact. The contact of two spherical bodies, and of a tangent with the circumference of a circle, is only in one point.

CONTAGION, in physic, the communicating a disease from one body to another, either by contact or morbid effluvia.

CONTARA, a name used by some botanists for the plant that produces the ignatius's beans, used in medicine.

CONTEMPLATION, an act of the mind, whereby it applies itself to consider and reflect upon the works of God, nature, &c.

CONTEMPORARY, a person or thing that existed in the same age with another. Thus Socrates, Plato, and Aristophanes, were cotemporaries.

CONTENEMENT, in our old law books, a term of different import; being sometimes used for credit, or countenance; and, at other times, for the maintenance proper for each person, according to his rank and condition in the commonwealth.

CONTENT, in geometry, the area or quantity of matter or space included in certain bounds.

For the contents of vessels of different kinds, see the article GAUGING.

CONTENTIOUS JURISDICTION, in law, denotes a court which has power to decide differences between contending parties.

CONTEXT, among divines and critics, that part of scripture or of a writing that precedes and follows the text. See the article TEXT.

CONTIGNATION, in the ancient architecture, the art of laying rafters together, and particularly flooring.

CONTIGUITY, in geometry, is when the surface of one body touches that of another.

CONTI-

CONTIGUOUS ANGLES, in geometry, are such as have one leg common to each angle, and are sometimes called adjoining angles, in contradistinction to those produced by continuing their legs through the point of contact, which are called opposite or vertical angles. See ANGLE.

CONTINENT, in general, an appellation given to things continued without interruption; in which sense we say, continent fever, &c. See the article FEVER.

CONTINENT, in geography, is what is frequently called the main land, and comprehends several countries, kingdoms, and states, not separate from each other; being only four, viz. Europe, Asia, Africa, and America.

To the north of Europe is contained Russia, Sweden, Norway, Denmark, and France. In the middle, Germany and Poland; and to the south, Spain, Italy, and Turkey in Europe.

To the north of Asia is comprehended the vast continent of Tartary; and to the south, China, India, Persia, and Turkey in Asia.

In Africa, is contained Egypt, Barbary, Biledulgerid, Zara or the Desart, Negroland, Guiney, Nubia, and Ethiopia Interior and Exterior.

To the north of America we have Mexico, Granada, Florida, Terra Canadensis, Terra Aretica; and to the south, Terra Firma, Peru, the land of the Amazons, Brasil, Chili, Paraguay, Patagonia, and Terra Antartica.

CONTINENT *Cause of a Distemper*, that upon which the disease depends so immediately, that it continues so long as that remains, and no longer.

CONTINENT FEVER, that which proceeds to a crisis, without either intermission or remission. See the article SYNOCHUS.

CONTINGENT, something casual or uncertain. Hence future contingent, in logic, denotes a conditional event which may or may not happen, according as circumstances fall out. The Socinians maintain, that God cannot foresee future contingents, because depending on the free motions of the will of man.

CONTINGENT is also a term of relation for the quota that falls to any person upon a division. Thus each prince in Germany, in time of war, is to furnish so many men, so much money and ammunition for his contingent.

CONTINGENT USE, in law, is an use limited in a conveyance of lands which may or may not happen to vest, according to the contingency mentioned in the limitation of the use. And a contingent remainder is when an estate is limited to take place at a time to come, on an uncertain event.

CONTINGENT LINE, in dialling, is a line that crosses the substyle at right angles. See SUBSTYLE and DIALLING.

CONTINGENTS are sometimes used by mathematicians in the same sense as tangents. See the article TANGENT.

CONTINUAL CLAIM, in law, a claim that is made from time to time within every year and a day to lands, &c. which in some respect one cannot attain without danger.

CONTINUAL PROPORTION. See the article PROPORTION.

CONTINUANTO, a term used in a special declaration of trespass, where the plaintiff would recover damages for several trespasses in one and the same action.

CONTINUATO, in music, signifies, especially in vocal music, to continue or hold on a sound in an equal strength or manner, or to continue a movement in an equal degree of time all the way.

CONTINUED PROPORTION, in arithmetic, is that where the consequent of the first ratio is the same with the antecedent of the second; as 4 : 8 : 8 : 16, in contradistinction to discrete porportion. See the article DISCRETE.

CONTINUED *Thorough Bass*, in music, that which continues to play constantly, both during the recitatives and to sustain the chorus. See the article CHORUS.

CONTINUO, in music, signifies the thorough bass, as basso continuo, is the continual or thorough bass.

CONTINUOUS FEVERS, those otherwise called continent. See CONTINENT.

CONTOBABDITES, in church history, a sect of heretics in the sixth century, who allowed of no bishops.

CONTOUR, in painting, the out-line, or that which defines a figure.

A great part of the skill of the painter lies in managing the contours well. Contour, with the Italian painters, signifies the lineaments of the face.

CONTOURNE, in heraldry, is used when a beast is represented standing or running with its face to the sinister side of the escutcheon, they being always supposed to look to the right, if not otherwise expressed.

CONTOURNIATED, a term among antiquaries applied to medals, the edges of which appear as if turned in a lathe.

CONTRABAND, in commerce, a prohibited commodity or merchandize bought or sold, imported or exported, in prejudice to the laws and ordinances of a state, or the public prohibitions of the sovereign.

Contraband goods are not only liable to confiscation themselves, but also subject all other allowed merchandise found in the same box, bale, or parcel, together with the horses, waggons, &c. which conduct them. There are contrabands likewise, which besides the forfeiture of the goods,

are attended with several penalties and disabilities.

CONTRACT, in a general sense, a mutual consent of two or more parties, who voluntarily promise and oblige themselves to do something, pay a certain sum, or the like. All donations, exchanges, leases, &c. are so many different contracts.

CONTRACT, in common law, an agreement or bargain between two or more persons with a legal consideration or cause; as where a person sells goods, &c. to another for a sum of money; or covenants, in consideration of a certain sum, or an annual rent, to grant a lease of a messuage, &c.

CONTRACT is also used for the instrument in writing which serves as a proof of the consent granted, and the obligation passed between the parties.

CONTRATILE FORCE, that property or power inherent in certain bodies, whereby, when extended, they are enabled to draw themselves up again to their former dimensions.

CONTRACTION, in grammar, is the reducing of two syllables into one, as *can't* for *cannot*, *should'st* for *shouldest*, &c.

CONTRACTION, in logic, a sort of reduction, whereby things are abridged, or brought into less compass.

CONTRACTION, in physics, the diminishing the extent or dimensions of a body, or the causing its parts to approach nearer to each other, in which sense it stands opposed to dilatation or expansion.

CONTRADICTION, a sort of direct opposition, wherein one thing is found directly contrary to another.

CONTRADICTORY PROPOSITIONS, in logic, are such as differ both in quality and quantity, one being universal, and the other particular, which constitutes the opposition of quantity; one affirmative and the other negative, which makes the opposition in quality: thus, A. *Every vine is a tree.* O. *Some vine is not a tree.* These can never be both true, and both false at the same time. To this it is necessary that the one deny, and the other affirm, the same thing of the same subject, considered in the same circumstances, every thing having always its own essence. This logicians express by *affirmare, & negare idem, de eodem secundum idem.* If two universals differ in quality, they are contradictory; as, A. *Every vine is a tree.* E. *No vine is a tree.* Those can never be both true together, but they may be both false. If two particular propositions differ in quality only, they are subcontradictory; as, J. *Some vine is a tree.* O. *Some vine is not a tree.* These may be both true together, but they can never be both false. There are likewise contradictory propositions on an individual, which are called single contradictories; as, *Peter is just, Peter is not just.* Now in such as these, Peter must be considered at the same time, without which they may be both true; since there was a time wherein Peter was just, and wherein he was not.

Seeming contradictories is when the members of a period quite disagree in appearance and sound, but perfectly agree and are consistent in sense: thus,

> "Cowards die many times before their death;
> "The valiant never taste of death but once."
>
> SHAKESPEAR.

CONTRA-FISSURE, in surgery, a kind of fracture, or fissure, in the cranium, which sometimes happens on the side opposite to that which received the blow; or, at least, at some distance from it.

CONTRA-HARMONICAL PROPORTION, in arithmetic, is that relation of three terms, wherein the difference of the first and second is to the difference of the second and third, as the third is to the first: thus, 3, 5, and 6, are numbers contra-harmonically proportional, for 2 : 1 :: 6 : 3.

CONTRA-INDICATION, in medicine, an indication which forbids that to be done, which the main scope of a disease points out: as if, in the cure of a disease, a vomit was judged proper; if the patient be subject to a vomiting of blood, it is a sufficient contra-indication as to its exhibition. See INDICATION.

CONTRALTO, in music, a term used by the Italians for two haut contres, because they play contrary to each other. See the article HAUT CONTRE.

CONTRAMURE, in fortification, is a wall built before another partition-wall, to strengthen it, so that it may receive no damage from the adjacent buildings. See WALL and RAMPART.

CONTRAST, in painting and sculpture, expresses an opposition or difference of position, attitude, &c. of two or more figures, contrived to make variety in a painting, &c. as where, in a groupe of three figures, one is shewn before, another behind, and another sideways, they are said to be in contrast.

The contrast is not only to be observed in the position of several figures, but also in that of the several members of the same figure: thus, if the right arm advance fartherest, the right leg is to be hindermost; if the eye be directed one way, the arm to go the contrary way, &c. the contrast must be pursued even in the drapery.

CONTRAST, in architecture, is to avoid the repetition of the same thing, in order to please by variety.

CONTRATE-WHEEL, in watch-work, that next to the crown, the teeth and hoop whereof lie contrary to those of the other wheels, from whence it takes its name. See the article WATCH.

CONTRAVALLATION, in the military art, a line formed in the same manner as the line of circum-

circumvallation, to defend the beſiegers, or the army which forms the ſiege, againſt the enterprizes of the garriſon.

The trench of the circumvallation is towards the field, at the foot of the parapet; and that of the contravallation towards the town, and alſo at the foot of the parapet. The line of contravallation is never made but when the garriſon is numerous enough to harraſs and interrupt the beſiegers by ſallies.

This line is conſtructed in the rear of the camp, and by the ſame rule as the line of circumvallation, with this difference, that as it is only intended to reſiſt a body of troops much inferior to a force which might attack the circumvallation, ſo its parapet is not made ſo thick, nor the foſſe ſo wide and deep. Its parapet need not be more than ſix feet thick, and the ditch eight feet at the brink, and five feet deep: the redans of this line are conſtructed in the ſame manner as in the circumvallation. All that concerns this line, may be ſufficiently known by an examination of the figure of it in Plate XXXVIII. which exhibits a part of this, and part of the circumvallation, with the camp in the interval.

Amongſt the antients this line was very common, but their garriſons were much ſtronger than ours; for as the inhabitants of towns were then almoſt the only ſoldiers, there were commonly as many troops to defend a place as there were inhabitants in it.

The lines of circumvallation and contravallation are very ancient, examples of them being found in hiſtories of the remoteſt antiquity. The author of the Military Hiſtory of Louis le Grand, pretends, however, that Cæſar was the firſt inventor of them; but it appears from the Chevalier de Folard's Treatiſe on the Method of Attacks and Defences of Places, uſed by the Antients, how little foundation there is for this opinion. This author aſſerts, with great probability on his ſide, that theſe lines are as antient as the time in which towns were firſt ſurrounded with walls, or in other words, fortified.

CONTRAYERVA, in the materia medica, the name which the roots of the dorſtenia is known by in the ſhops. See the article DORSTENIA.

The root is an inch or two in length, and about half an inch thick; full of knots and irregular tubercles; ſurrounded on all ſides with numerous long tough fibres, moſt of which are loaded with ſcaly knobs; of a reddiſh brown colour on the outſide, and pale within. It was firſt brought into Europe, about the year 1581, by Sir Francis Drake.

This root, freed from the fibres, which are much weaker than the tuberous part, has a light aromatic ſmell, and a roughiſh, bitteriſh, penetrating taſte, which, as Teller obſerves, is not eaſily concealed by a large admixture of other ſubſtances. It is given, as a diaphoretic and antiſeptic, in low and malignant fevers, and appears to be one of the mildeſt and ſafeſt of the ſubſtances of the pungent kind commonly made uſe of in theſe intentions, not being liable to produce, though taken pretty freely, any conſiderable heat. The doſe, in ſubſtance, is from five or ſix grains to half a dram and more; in decoction or infuſion, from half a dram to two drams.

CONTRE, in heraldry, an appellation given to ſeveral bearings, on account of their cutting the ſhield contrary and oppoſite ways: thus we meet with contre-bend, contre-chevron, contre-pale, &c. when there are two ordinaries of the ſame nature oppoſite to each other, ſo as colour may be oppoſed to metal, and metal to colour.

CONTRIBUTION, in a general ſenſe, the payment of each perſon's quota, or the ſhare he bears in ſome impoſition or common expence. Contributions are either voluntary, as thoſe of expences for carrying on ſome undertaking for the public intereſt; or involuntary, as thoſe of taxes and impoſts.

CONTRIBUTION, in a military ſenſe, an impoſition or tax paid by frontier-countries to an enemy, to prevent their being plundered and ruined by him.

CONTRITION, in theology, a ſorrow for our ſins, reſulting from the reflection of having offended God, from the ſole conſideration of his goodneſs, without any regard to the puniſhment due to the treſpaſs, and attended with a ſincere reſolution of reforming them.

CONTROL, COMPTROL, or CONTROLE, is properly a double regiſter kept of acts, iſſues of the officers or commiſſioners in the revenues, army, &c. in order to perceive the true ſtate thereof, and to certify the truth, and the due keeping of the acts ſubject to the enregiſterment.

CONTROLLER, an officer appointed to control or overſee the accounts of other officers, and, on occaſions, to certify whether or no things have been controlled or examined.

CONTROLLER *of the Navy*, one of the principal officers of the navy-board, at which he preſides to ſuperintend and control the inferior and civil department of the marine, as the admiralty directs the ſuperior and military operations of it.

CONTROVER, in law, a perſon who, of his own head, invents and ſpreads falſe news.

CONTUMACY, in law, a refuſal to appear in court, when legally ſummoned; or the diſobedience to the rules and orders of a court having power to puniſh ſuch offence.

CONTUSION, in medicine, a bruiſe, or a ſolution of continuity, produced in any part of the body by any inſtrument whoſe ſurface does not riſe by way of edge, but in any obtuſe figure; by this means a contuſion is diſtinguiſhed from a wound, which is a ſolution of continuity produced by a ſharp cutting inſtrument.

CONVALLARIA, lily of the valley, in botany, a genus of plants, whose flower is monopetalous and campanulated, divided at the top into six obtuse parts, which spread open and are reflexed; it hath six subulated filaments inserted in the petal, which are topped with oblong erect antheræ. The fruit is a globose berry with three cells, containing a roundish seed.

The common lily of the valley hath a slender, white fibrous root, creeping near the top of the ground. The leaves come out by pairs, of a shining light green, oblong, acuminated, and nervous; the foot-stalks of the flowers arise immediately from the root on one side of the leaves; these are naked, about five inches long, and are furnished toward their top with pendulous white flowers, of an odoriferous scent. This plant is perennial, grows wild in woods and shady places, flowers in May, and the seeds are ripe in autumn. The flowers are used in medicine; they have a bitterish taste, and when dried, powdered, and snuffed up the nose, prove a strong sternutatory; they are esteemed cephalic and cordial, and therefore recommended in palsies, epilepsies, and spasms. Of these flowers was formerly prepared a distilled water, a conserve, and an oil, but they are all now much in disuse. To this genus Linnæus has added the polygonatum and unifolium of other authors.

CONVENTICLE, a private assembly or meeting for the exercise of religion.

CONVENTION, a treaty, contract, or agreement between two or more parties. Every convention among men, provided it be not contrary to honesty and good manners, produces a natural obligation, and makes the performance a point of conscience.

Convention is also a name given to an extraordinary assembly of parliament, or the states of the realm, held without the king's writ.

CONVENTUAL, in general, denotes something belonging to a convent or monastery.

CONVERGING, or Convergent Lines, in geometry, are such as continually approach nearer one another; or whose distance becomes still less and less. These are opposed to divergent lines, the distance of which become continually greater: those lines which converge one way, diverge the other.

Converging Hyperbola, is one whose concave legs bend in towards one another, and run both the same way. See Hyperbola and Curve.

Converging Rays, are such as, proceeding from a body, approach nearer and nearer together in their progress, tending to one certain point, where they all unite: thus the rays proceeding from the object A B (Plate XXXVII. *fig.* 9.) to the point F, F, are said to converge towards that point.

CONVERSE, in mathematics. One proposition is called the converse of another, when, after a conclusion is drawn from something supposed in the converse proposition, that conclusion is supposed; and then, that which in the other was supposed, is now drawn as a conclusion from it: thus, when two sides of a triangle are equal, the angles under these sides are equal; and on the converse, if these angles are equal, the two sides are equal. See Triangle.

CONVERSION, in a moral sense, implies a repentance of temper and conduct unworthy our nature, and unbecoming our obligations to its author, and a resolution to act a wiser and a better part for the future.

Conversion, in rhetoric, &c. is understood of arguments, which are returned, retorted, and shewn on opposite sides, by changing the subject into the attribute, and the attribute into the subject. See Attribute, &c.

Conversion, in war, a military motion whereby the front of a battalion is turned where the flank was, in case the battalion is attacked in the flank. See the article Quarter-wheeling.

Conversion *of Equations*, in algebra, is when the quantities sought, or any part or degree thereof being fractions, the whole is reduced to one common denominator which may be omitted. Thus, suppose $a + b = \frac{x - z}{a}$, then multiplying all the numerators in the equation by a excepting its own, it will stand thus $aa + ba = x - z$ therefore conversion of equations is nothing more than what is commonly termed clearing an equation from fractions, which is done by multiplying each numerator in the equator by the fraction's denominator, only omitting the fraction's own denominator. See Equation.

CONVEX, an appellation given to the exterior part or surface of any thing that is globular or gibbous, in opposition to the hollow or inner surface of such bodies, which is called concave; thus we say a convex frieze, lens, mirrour, &c.

Convex Lens is a glass that has one of its superficies convex, and the other plane, which is called Plano-convex. Or it has both sides spherical, and then is called a double convex lens.

As perspectives of one convex-glass make objects appear upright, which those of two convex-glasses invert, and again those of three rectify, so it should seem that those of four should invert; and yet experience shews that objects appear upright through these glasses.

According to Mr. Molyneux, this phænomenon appears easily explicable from the consideration of placing glasses in a tube; which is thus, after the object-glass, the eye-glass is placed so much distant, towards the eye, from the focus of the object-glass, as is the focus of the eye-glass; then the middle eye-glass is placed at such a distance from the focus of the first eye-glass, as is the focus of this middle eye-glass; lastly, the nearest eye-glass is placed

placed so much distant from the focus of this middle eye-glass, as is the focus of this nearest eye-glass; and the eye, looking through them all, is placed in the focus of this nearest eye-glass: therefore, in the first place, one single convex-glass cannot properly be said by itself to shew objects erect or reversed, but in respect of placing the eye, that looks through it; for if the eye be placed nearer to it, than the focus of the glass, the objects are erect; if the eye be placed just in the focus, the objects are neither erect nor reversed, but all in confusion, and between both; and if the eye be placed farther from the glass than the focus, the objects are reversed; and here by distant objects are meant, the rays, flowing from any point of which, may be counted to come parallel towards the object-glass: secondly, the object-glass of a telescope reverses the object, both to the eye-glass and to the eye, that looks through it; for the eye-glass is placed farther from the object-glass than is the focus of the object-glass; but the eye-glass contributes nothing towards the rectification or reversion, the eye being placed just in its focus: thus we see, that the reversing of objects in a telescope of two convex-glasses proceeds wholly from the object-glass and its position; and the eye-glass contributes nothing thereto; for were the eye itself in the place of the eye glass, it would see the objects inverted through the single object-glass. To come now to the second eye-glass placed after the first, which is that next the object-glass, it is manifest that if we place our eye nearer to this middle eye-glass than its focus, the eye sees the objects inverted and confused; place the eye in the focus, the objects appear all in confusion, and neither erect nor reversed; for here again there is a distinct representation of the object to be received on a piece of paper, as in the focus of the object-glass, and the eye being situated at any time at this place, which is usually called the distinct base, sees all in confusion; but then let the eye be placed farther from this middle-glass than its focus; it perceives the objects erect and confused: lastly, the third or immediate eye-glass contributes nothing towards the erecting or reversing the species, which it receives erect from the middle eye-glass, no more than in a telescope of two convex-glasses, the eye-glass contributes to the species it receives from the object-glass, as was shewn before: the reason, that this last or immediate eye-glass has nothing to do in the erecting or reversing the species, is the same, as in a telescope of two convex-glasses, viz. the eye is placed in its focus, and therefore sees the species, as represented in the distinct base; that is, the species is inverted in the distinct base of the object-glass, and therefore a single convex eye-glass brings it to the eye inverted; but in the distinct base of the middle, or second eye-glass, the species is erect, and therefore the third or immediate eye-glass brings it to the eye erect: wherefore we are to consider the telescope, consisting of an object-glass and three eye-glasses, as two telescopes, each consisting of two convex-glasses; the first consists of the object-glass and first eye-glass, and this inverts the species; that is, the species is inverted in the distinct base of the object-glass, and so brought to the eye: the second telescope consists of the two immediate eye-glasses, and this renders erect what the former inverted; that is, the species in the distinct base of the middle eye-glass is erect, and is brought to the eye by the eye-glass; the eye-glasses themselves, in neither case, having any thing to do with the erecting or inverting, but merely representing in the same posture the species immediately before them: therefore, in the last place, one convex-glass, as posited in a telescope, inverts; the second, that is, the first eye-glass does nothing towards erecting or reversing, but represents the image, as it is in the distinct base of the object-glass, that is inverted; the third glass erects, or rather restores, what was before inverted; the fourth represents the image as it receives it from the distinct base of the third, that is, erect.

CONVEX MIRROUR. See MIRROUR.

CONVEXITY, that configuration or shape of a body, on account of which it is denominated convex. See CONVEX.

CONVEYANCE, in law, a deed or instrument that passes land, &c. from one person to another.

The most usual conveyances are deeds of gift, bargain and sale, lease and release, fines and recoveries, &c. The words *give and grant*, are necessary in a conveyance at common law: but though some maintain that conveyances shall operate according to the words; yet, of late, the judges have a greater regard to the passing of the estate, than to the manner by which it is passed.

CONVICT, in common law, a person that is found guilty of an offence by the verdict of a jury.

CONVICTION, in theology, expresses the first degree of repentance, wherein the sinner becomes sensible of his guilt, of the evil nature of sin, and of the danger of his own ways. See CONTRITION.

CONVOCATION, an assembly of the clergy of England, by their representatives, to consult of ecclesiastical matters. It is held during the session of parliament, and consists of an upper and lower house. In the upper sit the bishops, and in the lower the inferior clergy, who are represented by their proctors, consisting of all the deans and archdeacons, of one proctor for every chapter, and two for the clergy of every diocese, in all one hundred and forty-three divines, viz. twenty-two deans, fifty-three archdeacons, twenty-four prebendaries, and forty-four proctors of the diocesan clergy. The lower house chooses its prolocutor, whose business it is to take care that the members attend, to collect their debates and votes, and to carry their

reſolutions to the upper houſe. The convocation is ſummoned by the king's writ, directed to the archbiſhop of each province, requiring him to ſummon all biſhops, deans, archdeacons, &c.

CONVOLVULUS, bindweed, in botany, a genus of plants, whoſe flower conſiſts of a perſiſtent monophyllous cup, cut at the extremity into five ſegments; the corolla is monopetalous and campanulated; it hath five ſubulated filaments, topped with ovated compreſſed antheræ. The fruit is a roundiſh capſule contained within the cup, and formed of one, two, or three valves, containing ſeveral ſeeds. There are many ſorts of convolvulus, ſeveral of which grow wild in this country, and are troubleſome weeds. Others, which are natives of foreign parts, are cultivated here for the beauty of their flowers, ſome of which are ſo tender as to require a hot-houſe. Many of the ſpecies are twining plants, and moſt of them are propagated by ſeeds.

CONVOY, in the marine, any fleet or navy of merchant-ſhips bound on a voyage to ſome particular port or rendezvous; or more particularly the ſhip or ſhips appointed to conduct and defend them on their paſſage thither.

Convoy, in military affairs, a detachment of troops employed to guard any ſupply of men, money, ammunition, proviſions, &c. conveyed in time of war by land to a town, army, or the like.

CONVULSION, *Spaſmus*, in medicine, a preternatural and violent contraction of the membranous and muſcular parts, ariſing from a ſpaſmodic ſtricture of the membranes ſurrounding the ſpinal marrow, and the nerves diſtributed from it, and an impetuous influx of the nervous fluid into the organs of motion.

CONVULSIVE, in medicine, a term applied to thoſe motions which naturally ſhould depend on the will, but are produced involuntarily by ſome external cauſe, as a contraction of the muſcles, &c. See the preceding article.

CONYZA, flea-bane, in botany, a genus of plants, the compound flower of which is tubuloſe, conſiſting both of hermaphrodite and female ones: theſe laſt have no flower petals; but the hermaphrodite ones conſiſt of one infundibuliform petal, divided into five patulous ſegments at the limb: the ſtamina are five very ſhort capillary filaments: the ſeeds are ſolitary, oblong, and crowned with ſimple downy filaments, and ſtand in the cup.

The common flea-bane is recommended in the jaundice, to promote the menſes, and in the ſtrangury. Some alſo make an ointment of its leaves and root, which is ſaid to cure the itch.

COOLER, among brewers, diſtillers, &c. a large veſſel wherein certain liquors are cooled, after having been boiled.

Coolers, in medicine, thoſe remedies which affect the organs of feeling with an immediate ſenſe of cold, being ſuch as have their parts in leſs motion than thoſe of the organs of feeling; as fruits, and all acid liquors: or they are ſuch as, by a particular viſcidity, or groſſneſs of parts, give the animal fluids a greater conſiſtency than they had before, and conſequently retard their motion; having leſs of that inteſtine force on which their heat depends.

Of this ſort are cucumbers, and all ſubſtances producing viſcidity.

COOM, a term applied to the ſoot that gathers over an oven's mouth; alſo for that black, greaſy ſubſtance, which works out of the wheels of carriages.

COOMB, or Comb *of Corn*, a dry meaſure containing four buſhels, or half a quarter. See the article Mrasure.

CO-ORDINATE, ſomething of equal order, rank, or degree with another.

COPAL, in natural hiſtory, a particular ſort of reſin brought in irregular lumps from New Spain, where it is ſaid to be obtained from different ſorts of large trees, of which eight are deſcribed by Hermandez. Some pieces are whitiſh, ſemi-tranſparent, friable, not unlike the finer kinds of common reſin groſsly powdered and forced together into a maſs. Others are more tranſparent and leſs friable, and of a yelloviſh or brown colour. It has a more agreeable ſmell than frankincenſe, to which ſome have reſembled it, and does not melt ſo thin or burn away ſo faſt upon a red hot iron. It does not ſoften in the mouth, on being chewed, like anime, with which it has been confounded by others. From theſe and other reſinous bodies it differs more remarkably in its being exceeding difficultly diſſoluble in rectified ſpirit of wine.

Solutions of copal have been greatly eſteemed as varniſhes, and the method of making the ſolution kept a ſecret in particular hands. Juncker informs us, that it readily ſucceeds, if ſpirit of ſal ammoniac, mixed with a due proportion of oil of ſpike or turpentine, is uſed for the menſtruum.

COPARCENERS, otherwiſe called *Parceners*, ſuch as have equal portions in the inheritance of their anceſtor.

COPE, among eccleſiaſtical writers, an ornament formerly worn by chantors and ſub-chantors, when they officiated in the church ſolemnity. It is alſo worn by Romiſh biſhops, and other ordinaries; and reaches from the ſhoulders to the feet.

Cope, among miners, a duty of ſix-pence for every load of ore.

COPERNICAN-SYSTEM, is that wherein the ſun is placed in the center, and ſuppoſed at reſt; and that all the primary planets revolve round it, in different periods of time, and at various diſtances: but yet,

yet, that such is the harmony of the whole, that there is this universal law observed by every one of them, viz. that the squares of the times of their periodical revolutions round the sun are as the cubes of their distances from him. This law likewise obtains amongst the secondary planets, with respect to their primary ones; and is therefore universal throughout the whole system.

In this system, the fixed stars are likewise supposed to be at rest; and that the apparent diurnal motion, which they and the sun appear to have from east to west, is entirely owing to the earth's motion round its axis from west to east; thereby causing the agreeable vicissitudes of day and night.

By whom this system was first invented is not perfectly known: the first revivers of it, that we know of, were Philolaus, Aristarchus, and Pythagoras; and after the last of these it was for some time called: it was also embraced by that able geometrician Archimedes. After him, it was almost forgotten, until the year 1500, when Copernicus revived it, and from whom it has its name. But it was never heartily approved of until the late illustrious Sir Isaac Newton took it in hand, and demonstrated the truth of it, by his theory of gravity, together with the universal law, mentioned above; and from him it is sometimes called the Newtonian system, and that more deservedly than by any other name whatsoever.

Various have been the arguments which have been brought pro and con, with regard to the truth of this system or hypothesis, and that of Ptolemy, which seems to have been always its most formidable antagonist. As to that of Tycho Brahe, it seems to partake of the inconveniencies of both, without giving a remedy for the defects of either in any great degree; and as it in some particulars partook of both, and, as it were, seemed a kind of moderator between them, it has shared the same fate which the generality of moderators do in warm disputes;—been taken to pieces and despised by both. But what is more strange than all the rest, is, that one and the same argument has been brought to prove both systems; this is the resistance a body would meet with moving in a contrary direction to that of the earth's rotation: the Ptolomaic instancing the flights of a bird east, which is as easily and expeditiously performed as the contrary way, although the motion of the earth is much swifter than the flights of any bird whatsoever; and, therefore, say the friends to this system, the bird would be so far from arriving at any place east of that it took flight from, that it would in reality be left behind. The Copernican fetches his example from the case of a ship sailing to and from the East-Indies; which is performed thither in three months, and is generally six in returning: and therefore it must be forwarded thither, and retarded in its return by the motion of the earth from west to east. (See Varenius's Syst. of Geography.) We must confess the Copernican has here greatly the worst of the argument; for his example is not only exaggerated, but even absurd; for the motion of the earth must equally affect the ship, and the place it is bound to; and, therefore, can never prove the motion of the earth. The truth is, the difference in those voyages proceeds from another cause. But the Ptolemaic has no great reason to boast of his superiority; for he does not consider, that the circumambient air is, by the motion and attraction of the earth, carried round along with it; and, consequently, that it communicates the same effect to the bird, or any other body whatsoever: the truth of which may be verified by a great number of familiar experiments; but the two following may suffice.

I. Convey one, or any number of flies into the cabin of a ship under sail, and, when they are set at liberty, and suffered to fly about, it may easily be observed they make their flight with as much ease towards the head of the ship, as they can towards the stern, let the ship's motion be ever so swift.

II. Take a bottle filled with water, and cork it up tight, and through the cork pass a fine capillary tube, such that, when the bottle is inverted, the water shall only drop through; fix it to the top of the cabin of a ship under sail, and place another bottle with a straight neck exactly under it, and you will find that all the drops of water will fall into this bottle, and not beside it, towards the stern of the ship, although the ship will move several inches while the drop is in the air.

We shall next give the reason why this system is now so generally received and approved, almost by every man of sound learning and judgment, together with our own remarks, and that without any partiality on either side of the question.

1. It is most simple, and agreeable to the tenor of nature in all her actions; for by the two motions of the earth, all the phænomena of the heavens are resolved, which, by other hypotheses, are inexplicable, without a great number of other motions contrary to philosophical reasonings. See the articles PTOLEMAIC and TYCAONIC SYSTEM.

Remark. This we think a very strong and unanswerable argument.

2. It is more rational to suppose that the earth moves round the sun, than that the huge bodies of the planets, the stupendous body of the sun, and the immense firmament of stars, should move round the inconsiderable body of the earth, every twenty-four hours.

3. But that harmony which upon this supposition runs through the whole solar system, wonderfully confirms this hypothesis, viz. that the motions of all the planets, both primary and secondary, are governed and regulated by one and the same law, which is, that the squares of the periodical times of the primary planets, are to each other as the cubes of their distances from the sun; and likewise the squares of

of the periodical times of the secondaries of any primary, are to each other as the cubes of their distances from that primary. Now the moon, which, in the Copernican system, is a secondary of the earth, in the other hypothesis is a primary one: and so the rule cannot take place, because the periodical time, considered as that of a primary one, does not agree therewith. See the article MOON, PERIOD, &c.

4. Again, this single consideration Mr. Whiston thinks enough to establish the motion of the earth for ever, viz. If the earth does not move round the sun, the sun must move with the moon round the earth. Now the distance of the sun, to that of the moon, being as 10,000 to 46, and the moon's period being less than 28 days, the sun's period would be found no less than 242 years; whereas, in fact, it is but one year.

5. The sun is the fountain of light and heat, which it irradiates through all the system, and therefore it ought to be placed in the center, so that the planets may at all times have it in an uniform and equable manner.

6. For if the earth be in the center, and the sun and planets revolve about it, the planets would then, like the comets, be scorched with heat, when nearest the sun, and frozen with cold in their aphelia, or greatest distance, which is not to be supposed.

7. If the sun be placed in the center of the system, we then have the rational hypothesis of the planets being all moved about the sun, by the universal law or power of gravity arising from his vast body, and every thing will answer to the laws of circular motion and central forces; but otherwise we are wholly in the dark, and know nothing of the laws and operations of nature.

Remark. These are all very sensible and strong proofs, but cannot amount to a mathematical demonstration.

8. But happily we are able to give not only reasons, but demonstrative proofs, that the sun does possess the center of the system, and that the planets move above it at the distance and in the order assigned in this and in other places. See the article DISTANCE.

The first is, that Mercury and Venus are ever observed to have two conjunctions with the sun, but no opposition, which could not happen, unless the orbits of these planets lay within the orbit of the earth.

Remark. This is accounted for by Ptolemy, as will appear from our remark on the 13th.

9. The second is, that Mars, Jupiter, and Saturn, have each their conjunctions and oppositions to the sun alternately and successively, which could not be, unless their orbits were exterior to the orbit of the earth.

Remark. This will also follow from Ptolemy's system.

10. In the third place, the greatest elongation or distance of Mercury from the sun, is about 20°, and that of Venus 47°; which answers exactly to their distance in this system, though in the Ptolemean system they might, and would, sometimes be seen 180° from the sun, viz. in opposition to him.

Remark. The latter part of this is false; and the former part of this article is true, in the Ptolemaic hypothesis as well as the Copernican, as will appear from our remark on the 13th article.

11. Fourthly, in this disposition of the planets they will all of them be sometimes much nearer to the earth than at others; the consequence of which is, that their brightness and splendor, and also their apparent diameters, will be proportionally greater at one time than another; and this we observe to be very true every day. Thus the apparent diameter of Venus, when greatest, is near 66″, but when least, not more than 9″ and a half; of Mars, when greatest, it is 21″, but when least, no more than 2″ and a half; whereas, by the Ptolemean hypothesis, they ought always to be equal.

12. The fifth is, that when the planets are viewed with a good telescope, they appear with different phases, or with different parts of their bodies enlightened. Thus Venus is sometimes new, then horned, and afterwards dichotomized, then gibbous, afterwards full, and so increases and decreases her light in the same manner as the moon, and as the Copernican system requires.

Remark. The Ptolemaic system, by their epicycles account, in some sort, for these appearances, though not in the same proportions or places, and therefore the strength of these arguments remain the same.

13. The sixth is, that the planets, all of them, do sometimes appear direct in motion, sometimes retrograde, and at other times stationary. Thus Venus, as she passes from her greatest elongation westward, to her greatest elongation eastward, will appear direct in motion, but retrograde as she passes from the latter to the former; and when she is in those points of greatest distance from the sun, she seems for some time stationary: all which is necessary upon the Copernican hypothesis, but cannot happen in any other.

Remark. This argument, though so particularly insisted on by the modern Copernicans, is absolutely, and in every respect, accounted for by the advocates of Ptolemy, in the following manner.

Let BC, DE, and FG, (Plate XXXIX. *fig.* 1.) be parts of the orbits of the Sun, Venus, and Mercury, respectively, ☉, the Sun, moving in his orbit from C towards B. Now Ptolemy supposed that two points, ♀ and M, in the orbits of Venus and Mercury respectively, and which were the centers of the epicycles of those planets, moved in such a manner as to be always in a right line drawn thro' the Earth and Sun, viz. T ☉; now if the diameter

ter of Venus's epicycle, in which ſhe was ſuppoſed to move, was equal to, or bore ſuch a proportion to her orbit in the Copernican ſyſtem, as her diſtance from the earth in one, bore to it in the other ſyſtem, be it what it would; it is evident that Venus would have her greateſt elongations at V and *v*, be retrograde in paſſing through that part of her epicycle next the earth; ſtationary at the points V and *v*; and be direct during her paſſage through that part of her epicycle, which is fartheſt from the earth, equally the ſame as in the Copernican ſyſtem.

The ſame will hold good with regard to Mercury, as is evident from the figure.

14. The ſeventh is, that the bodies of Mercury and Venus, in their lower conjunctions with the ſun, are hid behind the ſun's body, and in the upper conjunctions are ſeen to paſs over the ſun's body, or diſk, in form of a black round ſpot, which is neceſſary in the Copernican ſyſtem, but impoſſible in the Ptolemean ſyſtem.

Remark. This is a ſtrong and convincing proof of the truth of the Copernican ſyſtem.

15. The eighth, and laſt, is, that the times in which theſe conjunctions, oppoſitions, ſtations, and retrogradations of the planets happen, are not ſuch as they would be were the earth at reſt in its orbit, but preciſely ſuch as would happen were the earth to move, and all the planets in the periods aſſigned them; and therefore this, and no other, can be the true ſyſtem of the world.

Remark. This is equally falſe with the thirteenth.

16. But to all thoſe we may add, the aberration of light, lately diſcovered by that excellent and indefatigable aſtronomer, the late Dr. Bradly, and which we think is poor Ptolemy's *ne plus ultra*: it amounts to a mathematical demonſtration of the truth of the Copernican ſyſtem; for it is evident, [ſee the article ABERRATION] that if the earth had not a motion on its axis from weſt to eaſt, there could not be ſuch a thing as the aberration of light exiſting in nature.

COPERNICUS, the name of an aſtronomical inſtrument, invented by Mr. Whiſton, to exhibit the motion and phænomena of the planets, both primary and ſecondary. It is built upon the Copernican ſyſtem, and for that reaſon called by this name. It conſiſts of ſeveral concentrical circles of wood, upon which are inſcribed numbers, transferred hither from the aſtronomical tables; by the various diſpoſition of theſe circles, which are made ſo as to ſlide within each other, queſtions are ſolved ſo as to ſave long calculations. To exhibit eclipſes there is a particular apparatus, conſiſting of a terreſtrial globe, ſo diſpoſed, as that, being turned round its axis, the light of the ſun, or a candle projected through a glaſs plane, marked out into concentric circles, expreſſes the digits of the eclipſe: and thus is the path of the eclipſe, with its degree or quantity in any part of the path, repreſented with great accuracy.

The inventor of this inſtrument has wrote a treatiſe purpoſely to explain it.

COPHTS, COPHTI, or COPTS, a name given to ſuch of the Chriſtians of Egypt, as are of the ſect of Jacobites.

COPHTIC, or COPTIC LANGUAGE, is that ſpoke by the Cophts, being the ancient language of the Egyptians, intermixed with the Greek, and the characters of it being thoſe of the Greek.

COPTIC MONKS, religious, among the Chriſtians of Egypt, who have the higheſt veneration for a monaſtic life, conſidering it as the philoſophy of the law of Jeſus Chriſt, and the monks as terreſtrial angels, or celeſtial men. They are obliged to part with their poſſeſſions, to renounce marriage for ever, to live in deſarts, to be cloathed in wool, and to eat no meat.

COPING, or COPPING *of a Wall*, in architecture, the top or covert of a wall, made ſloping, to carry off the wet.

COPING *over*, in carpentry, a ſort of hanging over, not ſquare to its upright, but bevelling on its under ſide, till it ends in an edge.

COPIVI, or *Balſam of* COPIVI. See the article BALSAM.

COPPEL, COPEL, or CUPPEL, a chemical veſſel made of earth, pretty thick, and of the form of a platter or diſh.

It ſuſtains the higheſt degree of fire, and retains all fuſed metals: but in it all the foſſile portions of any metal, when mixed with fuſed lead, are carried off, except gold and ſilver, which are left behind in ſmall globules. See ASSAYING.

COPPELLING, or CUPELLING, in chemiſtry, is the putting metallic ſubſtances into a coppel, or covered veſſel, made of bone-aſhes, and ſet in a naked fire, to try what gold or ſilver they will afford.

COPPER, *Venus*, in natural hiſtory, a reddiſh metal, eaſily tarniſhing in a moiſt air, and contracting a green or a bluiſh green ruſt. It is the moſt elaſtic and ſonorous of all the metals, and the hardeſt of all but iron. It ſpreads difficultly under the hammer, but may be extended to a great degree, drawn into fine wire, and beat into thin leaves. Its ſpecific gravity is near nine times greater than that of water.

It requires for its fuſion a ſtrong white heat, greater than that in which gold and ſilver melt, though not ſo great as that which is requiſite for the fuſion of iron. When melted, it is remarkably impatient of moiſture: the contact of a little water occaſions the melted copper to be thrown about with violence, to the great danger of the by-ſtanders. It may nevertheleſs be granulated, like other metals, by cautiouſly pouring a very little at a time into water.

Kept in a heat below fuſion, it contracts on the ſurface thin powdery ſcales, which, if rubbed off, are ſucceeded by freſh ones, till the whole quantity of the metal is thus ſlowly changed into a dark reddiſh ſcoria or calx. This does not melt in the greateſt degree of fire that our furnaces are capable of giving; but in the concentrated ſolar heat, it runs eaſily into a deep red and almoſt opake glaſs. A flaming fire, and a ſtrong draught of air over the ſurface of the metal, promote its calcination: the flame being tinged of a green, bluiſh, or rainbow colours, is a mark that the copper burns.

Copper is exceeding rarely found pure in the earth. Of its ores there is a great variety, intermixed with different ſtony matters, generally abounding with ſulphur, ſometimes containing a little arſenic. Theſe ores are often of beautiful colours, blue, red, green, yellow, variegated like the rainbow or peacock's tail, moſt commonly green or blue: they are of all ores the moſt beautiful. The lapis lazuli, from which the precious blue pigment called ultramarine is prepared, is one of the ores of this metal. Some of them contain no metal but copper; many have an admixture of others; and there are few ores of other metals without ſome portion of copper in them. Copper is of all metals the moſt difficultly obtained pure from the ore; ſulphur adhering to it ſo ſtrongly, as not to be expelled without long calcination. When copper and iron are blended together in the ore, the copper cannot by any method as yet known, be ſeparated to advantage: a rich copper mine, at Lauterberg in the Hartz foreſt, lies on this account unworked.

There are ores of copper in almoſt all parts of the world; in Spain, France, England, Norway, Saxony, Bohemia; but more particularly in Sweden, Hungary, and Tranſylvania. Japan affords a ſort of copper ſuperior to any met with in Europe.

Copper is found alſo in a vitriolic ſtate, diſſolved in certain waters, as at Neuſol in Hungary: when iron is put into the water, the diſſolved copper ſeparates; a proportionable quantity of the iron being diſſolved in its place. The copper, extricated from the liquor, adheres to the iron, and covers its ſurface with a bright cupreous cruſt: ſome have been ſo far impoſed on, as to imagine the iron, by this means, actually tranſmuted into copper.

COPPER-PLATES *for engraving*. Plates intended for engraving ought to be formed of the beſt copper; which can be diſtinguiſhed only by examining it with regard to the qualities requiſite to the conſtituting it good. Thoſe qualities are, that it ſhould be very malleable, that is, capable of being ſpread with the hammer, or ſuffering itſelf to be rolled or drawn out to the niceſt or ſmalleſt pieces; that it ſhould nevertheleſs be firm, and reſiſt even to ſome degree of hardneſs, provided no ſhortneſs of grain or brittleneſs attend, but that it be perfectly ductile; and that it be free from any veins, ſpecks, or diſſimilar parts, but of an equal texture through the whole. The redneſs of copper is a preſumptive mark of its being good, but not an infallible one: for though it is in general a proof of the purity of the copper, yet it does not evince that the qualities may not be injured by too frequent fuſions, or the calcinations it may have undergone, if, as is frequently the caſe, it has before been employed in forming ſome utenſil.

The copper being choſen, it muſt be fabricated into plates of the ſize demanded, the thickneſs of which may be in proportion of a line to plates that are a foot by nine inches. Theſe plates muſt then be well forged and planiſhed by a brazier; which ſhould be done cold: for by managing this operation well, the poroſity of the copper may be greatly removed, which is for the moſt obvious reaſons of great conſequence. When a plate is forged, it ſhould be examined which ſide is the moſt even, and the leaſt flawed or cracked; and then the poliſhing may be thus performed.

Put the plate upon a board leaning obliquely, and in the bottom of which two nails or points are fixed, to keep it from ſliding off; and then take a large piece of grind-ſtone dipt in water, and rub it very ſtrongly once in every part length-ways, and then the ſame breadth-ways, keeping it moiſt with water; and repeat this operation till no hollows appear, nor the leaſt mark made by the hammer in forging, or any other flaws, holes, or inequalities. After this take a piece of good pumice-ſtone, and rub the plate with it in the ſame manner as was done before with the grind-ſtone, till all the ſcratches and marks made of the grind-ſtone may, by the pumice-ſtone, be likewiſe taken away, and then waſh it thoroughly clean. The ſcratches and marks of the pumice-ſtone ſhould then be taken out by rubbing the plate in the ſame manner with a piece of oil-ſtone, till all the marks and ſcorings of the pumice-ſtone be taken out: and the plate ſhould be then waſhed with water till it be perfectly clean. A proper kind of coal muſt in the mean time be prepared for finiſhing the preparation of the plate, which muſt be done in the following manner:

Take three or four large coals of ſallow wood, ſound, and without clefts, and place them together in a fire made on a hearth, and cover them with other burning coals; heaping a quantity of red-hot aſhes upon them. In this manner let them remain, being ſubject to only a ſmall acceſs of air, for about an hour and a half: but the time ſhould be greater or leſs, according to their ſize, that the fire may penetrate into the innermoſt part of them, and expel all the ſmoke that can be driven out; to be certain of which, it is better they ſhould ſtay in the fire rather longer than is neceſſary, than that the time ſhould be unduly ſhortened. When they are fit to be taken out, a veſſel of water large enough to hold them ſhould be prepared; and they ſhould

be instantly thrown into it, and left there to extinguish and cool. For this purpose some use urine instead of water; but there is no difference, unless in the disagreeable smell of the latter. The coals being thus prepared, pick out one, or a part of one, sufficiently large, firm, and free from clefts; and holding it fast in the hand, set one of the corners against the plate, and rub it, but without observing any particular direction, to take out the marks or scorings of the oil-stone: but if the coal glide on the surface, and take no effect, it is a proof of its not being fit for the purpose; and another, that is not so faulty, must be used instead of it. This fitness may be thus distinguished; that the coal, if good, being wet, and rubbed on the copper, will seem rough, and grate it with a low murmuring noise. When a good coal is obtained, the operation must be continued, till not the least scoring, flaw, or hole whatever, appears; but if the coal itself, as will sometimes happen, be too hard, and leaves traces or scores of its own forming, a softer one must be chosen, and used in the same manner as the first, to remedy the defects of it, and to procure a perfectly clear and even surface on the plate.

This is the method directed by Le Bosse: but the end may be better answered, by first wearing out the marks of the planishing hammer, by rubbing with emery finely ground; and then, the plate being washed clean, brushing it over with the refiner's aqua-fortis; which must be suffered to lie on till the ebullition it produces begins to decrease; and then washed off, by immersing the plate in water; when it will be found to be brought to a better condition to take the burnish with more certainty, than by the laborious use of so many stones and the coal.

The plate being brought to this state, the polishing must be finished with a steel burnisher, with which it must be strongly rubbed; the best method of moving the burnisher is not to work it lengthways, or breadth-ways, but in a diagonal direction, or from corner to corner, which will more effectually take out all remains of the former scorings or lines. The copper must be thus burnished till it be as bright as a looking-glass in every part; but if, when the rest is thus bright, some particular spots appear dull, or that any lines remain, such faults should be again worked with the burnisher, till the whole be uniformly shining.

COPPERAS, a name given to the factitious green vitriol. See the article VITRIOL.

COPPICE, or COPSE, a little wood, consisting of under-woods, or such as may be raised either by sowing or planting.

COPULA, in logic, the verb that connects any two terms in an affirmative or negative proposition; as "Riches make a man happy;" where *make* is the copula: "No weakness is any virtue;" where *is* is the copula.

COPULATION, the act of generation, or the congress of the male and female, otherwise called coition.

COPULATIVE PROPOSITIONS, in logic, those where the subject and predicate are so linked together, by copulative conjunctions, that they may be all severally affirmed or denied one of another. Example, "Riches and honours are apt to elate "the mind, and increase the number of our "desires."

COPULATIVE CONJUNCTION. See the article CONJUNCTION.

COPY, in a law sense, signifies the transcript of any original writing, as the copy of a patent, charter, deed, &c.

COPY, among printers, denotes the manuscript, or original of a book, given to be printed.

COPY-HOLD, a tenure for which a tenant has nothing to shew but the copy of the rolls made by the steward of the lord's court.

COPY-HOLDER, one who is admitted tenant of lands or tenements within a manor, which, time out of mind, by use and custom of the manor, have been demisable and demised to such as will take them in fee-simple or fee-tail, for life, years, or at will, according to the custom of the manor by copy of court-roll; but is generally where the tenant has such estate either in fee or for three lives.

COR, *the* HEART, in anatomy. See HEART.

COR CAROLI, in astronomy, an extra-constellated star in the northern hemisphere, situated between the coma Berenices, and ursa major, so called by Dr. Halley in honour of king Charles.

COR HYDRA, a fixed star of the first magnitude, in the constellation of hydra.

COR LEONIS, or REGULUS, in astronomy, a fixed star of the first magnitude, in the constellation leo.

CORACOBRACHIALIS, in anatomy, a muscle that has its origin at the coracoide process of the scapula, and its termination about the middle part of the arm. It serves to lift the arm obliquely outwards.

CORACOHYOIDÆUS, in anatomy, a muscle which having its origin from the upper edge of the scapula, near its neck, ascends obliquely under the mastoidæus, and is inserted in the os hyoides, which it serves to pull obliquely downwards. See the article HYOIDES.

CORACOIDES, in anatomy, a small, sharp process of the scapula, so called from its resembling a crow's bill.

The coracoide process in infants, is but a cartilage, afterwards it becomes an epiphysis; and, after this, about the age of sixteen, it is perceived to be a separate bone. It serves to strengthen the articulation of the shoulder, and gives origin to one of the muscles of the arm.

CORACOMANTES, in antiquity, perſons who foretold events from their obſervations on crows.

CORACO-RADIALIS, in anatomy, the ſame with biceps. See BICEPS.

CORAL, *Corallium*, a hard, brittle, branched ſubſtance, reſembling the ſtalk of a plant; uſually about the thickneſs of a gooſe's quill; full of knots; ſometimes ſtraight, and ſometimes variouſly bent; both externally and internally of a deep bright red colour. It is found adhering to rocks and other bodies in the ſea, particularly in the Mediterranean; covered with a ſoft fungous bark, in which is a great number of cells curiouſly divided, containing a milky juice, with apertures on the ſurface: this cortical part is ſeparated while freſh and ſoft. It has been generally referred to the vegetable kingdom; but is more probably the work and the neſt of little animals.

Artificial CORAL is made of cinnabar well beaten; a layer whereof is applied on a piece of wood well dried and poliſhed, being firſt moiſtened with ſize: the whole is then again poliſhed, and for varniſh rub it over with the white of an egg.

CORAL-TREE. See the article ERYTHRINA.

CORALLINE, *Corallina*, in botany, is a genus of ſubmarine plants, conſiſting of ſtalks and branches often beautifully ramified, and compoſed of joints of an oblong figure inſerted into one another. The greater part of theſe are gritty, and of a coral-like matter, but nature varies from this in ſome of the ſpecies, which are of a ſofter ſubſtance.

CORAM NON JUDICE, in law, is a term uſed where a cauſe is brought and determined in a court of which the judges there have not any juriſdiction.

CORAN or ALCORAN. See the article ALCORAN.

CORANA, a kind of phaſeolus, or kidney-bean, the down of whoſe pod is the common cow-itch.

CORBAN is a ſcripture term for an offering which had life, in oppoſition to the minchab, which had no life.

CORBEL, in architecture, the repreſentation of a baſket, ſometimes uſed to ſignify the vaſe of a tambour of the Corinthian column.

CORBEL, or CORBEIL, is alſo uſed in building, for a ſhort piece of timber, placed in a wall, with its end ſticking out ſix or eight inches, as occaſion ſerves, in the manner of a ſhouldering piece.

CORCHORUS, Jews-mallow, in botany, a genus of plants, whoſe flower conſiſts of five oblong, obtuſe petals, with a pentaphyllous calyx, and hath a great number of hairy filaments, topped with ſmall antheræ.

The fruit is a cylindrical pod, with five cells, and contains a number of angular, acuminated, ſeeds.

CORD, or CHORD, ſeveral threads, cabled or twiſted together by means of a wheel. See the article ROPE.

CORD *of Wood*, a certain quantity of wood for burning, ſo called becauſe formerly meaſured with a cord. The dimenſions of a ſtatute cord of wood are eight feet long, and four feet high, and four feet broad.

CORDAGE, in general implies all the running rigging of a ſhip, or all that which is employed to extend, contract, or traverſe the ſails; it is called *running*, becauſe it paſſes through blocks, and is frequently hauled in, or ſlackened as occaſion requires. See RIGGING.

CORDED, in heraldry. A croſs-corded ſome authors take for a croſs wound or wrenched about with cords. See the article CABLED-CROSS.

Others, with more probability, take it for a croſs made of two pieces of cord.

CORDELIER, in church hiſtory, a Franciſcan, or religious of the order of St. Francis.

CORDIAL, in medicine, whatever raiſes the ſpirits, and gives them a ſudden ſtrength and chearfulneſs.

CORDON, in fortification, a row of ſtones made round on the outſide, and raiſed between the wall of the fortreſs, which lies aſlope, and the parapat which ſtands perpendicular, in ſuch a manner, that this difference may not be offenſive to the eye: whence the cordons ſerve only as an ornament, ranging round about the place, being only uſed in fortifications of ſtone-work: for in thoſe made with earth, the void ſpace is filled up with pointed ſtakes.

CORDWAINERS, a term whereby ſhoe-makers are denominated in the ſtatutes.

CORED HERRINGS, thoſe caught in autumn on the coaſt near Yarmouth; which, being rolled in ſalt, are afterwards brought on ſhore to be made red-herrings.

CORIANDER, in botany, an umbelliferous plant, with a white, ſlender, root, from which ariſes a ſmooth, pithy, branching ſtalk. The lower leaves are broad and conjugated; but the upper are deeply cut into five ſegments. The flowers grow in umbels at the top of the branches, of a whitiſh purple colour: they are compoſed of five heart-ſhaped petals, with the ſame number of ſtamina. The fruit is ſpherical, and divided into two parts, each having an hemiſpherical concave ſeed. It is annual, flowers in June, and is a native of the ſouth of France, Spain, and Italy, and cultivated in ſome parts of England. The ſmell of the whole plant is ſtrong and aromatic; but not a little diſagreeable. The ſeeds alſo have, when freſh, a very unpleaſant flavour, which, by drying, becomes more mild, and have a ſweet agreeable taſte. The dried ſeeds are ſometimes employed as a ſtomachic and carminative; and are accounted good againſt ca-

tarrhs,

farrhs, flatulencies, worms, the cachexy, and ſlight obſtructions of the glands, and to ſtop hæmorrhages and fluxes.

CORIARIA MYRTLE, *Sumach*, in botany, a genus of plants producing male and female flowers, on different plants. The flower of each conſiſts of five petals very like the cup. It has no pericarpium; but contains five kidney-ſhaped ſeeds, incloſed in the petals.

There are two ſpecies in this genus, which grow wild about Montpelier in France, where it is uſed for tanning leather.

CORINTHIAN, in general, denotes ſomething belonging to Corinth: thus we ſay, Corinthian braſs, Corinthian order, &c.

CORINTHIAN ORDER, in architecture, the fourth order of architecture, according to Scamozzi; but Mr. Le Clerc makes it the fifth, being the moſt noble, rich, and delicate of all the other five.

Moſt authors aſcribe the invention of this order to Callimachus, a Corinthian ſculptor. Vilalpandus, however, oppoſes this opinion, and will have the Corinthian capital to have been derived from an order in Solomon's temple, the leaves whereof were thoſe of the palm-tree. The Corinthian order has ſeveral characters by which it is diſtinguiſhed from the reſt. Its capital is adorned with two rows of leaves, between which ariſe little ſtalks, or caulicoles, of which the volutes are formed, which ſupport the abacus, and are ſixteen in number. See ABACUS.

CORION, in botany, the ſame with the coriander. See CORIANDER.

CORIS, or COWRIES, in commerce. See the article COWRIES.

CORIS, in botany, a plant which grows wild about Montpelier, and in moſt places in the ſouth of France. The flower conſiſts of a ſingle ringent petal: the tube is cylindrical, and of the length of the cup; the limbs are divided into five oblong ſegments. The fruit is a globoſe capſule, formed of five valves, and ſituated in the bottom of the cup. The ſeeds are ſmall, numerous, and oval.

CORISPERMUM, in botany, a genus of plants whoſe flower conſiſts of two compreſſed, crooked-pointed petals, which are placed oppoſite to each other, and are equal, and contains a ſingle ſtamen. The germen is compreſſed and pointed, ſupporting two capillary ſtyles, each topped with an acute ſtigma: the germen afterwards becomes an oval compreſſed ſeed, with an acute margin.

CORK-TREE, in botany, a ſpecies of the quercus or oak. The cork-tree has a long thick, hard root, that produces a middle-ſized tree, with a thick trunk, and a few branches. It has a thick, light, ſpungy bark, of a yelloviſh grey colour. The leaves are oblong, oval, about two inches long, and one and a quarter broad; they are undivided and ſawed on their edges, and have a little down on their under ſides. Theſe leaves continue green through the winter till the middle of May, when they generally fall off juſt before the new leaves come out. The acorns are very like thoſe of the common oak, and is a native of the ſouthern parts of Europe.

The exterior bark of this tree is the cork; it is taken off every eight or ten years; but there is an interior bark which nouriſhes the tree; ſo that ſtripping off the outer, ſo far from injuring the tree, that it is neceſſary to continue them in health. In the month of July, the inhabitants of the places where they grow make an inciſion round both the top and root of the tree, and another longitudinally; when it is thus got off, they unwrap before a fire, and preſs it flat with weights, after which, they clean it, and export it to other countries.

The cork ſhould be choſen in fine boards, all of a piece, not full of knots or chinks, of a moderate thickneſs, yelloviſh without and within, and that which cuts even.

Its uſe is too well known to need any account of it: in medicine it is of ſervice to ſtop bleeding, being reduced to powder, or put into ſome aſtringent liquor: burned and mixed with the unguentum populneum, it is very proper for the piles. The Spaniards burn cork into an extraordinary fine black, called Spaniſh black, which is uſed for ſeveral ſorts of work.

CORK, or CORKING *of a Saddle*, the pieces to which the bolſters are made faſt; ſo called as having formerly been made of cork.

CORMORANT, in ornithology, the Engliſh name of a ſpecies of pelican, with fourteen long feathers in the tail, and the under part of the body whitiſh: it is a ſea-fowl, almoſt equal to a gooſe in ſize, and feeds on fiſh. All the writers on birds have deſcribed it under the names of carbo aquaticus, or corvus aquaticus.

CORN, in agriculture, the grain or ſeeds of divers plants; with us the principal are thoſe of wheat, barley, oats, and rye. See the articles WHEAT, BARLEY, &c.

Corn is very different from fruits, with reſpect to the manner of its preſervation; and is capable of being preſerved in public granaries for preſſing occaſions, and being kept many years. See the article GRANARY.

Corn likewiſe makes the firſt part of the Engliſh name of ſeveral plants, on account of their growing among corn. Thus we call the gladiolus, corn-flag; the chryſanthemum, corn-marigold; the ſiſon, corn-parſley; the valeriana, corn-ſallad, &c. See the articles GLADIOLUS, CHRYSANTHEMUM, &c.

Indian CORN. See the article ZEA.

CORN-MILL, a water-engine for grinding of corn. See MILL and GRINDING.

CORN, in medicine and ſurgery, a hard tubercle, like a flat wart, growing in ſeveral parts of the feet, eſpecially upon the joints of the toes. This diſorder

is not unjuſtly attributed to the wearing of too ſtraight or narrow-toed ſhoes, which never fail to produce theſe tubercles, eſpecially if the perſon is obliged to ſtand or walk much, and in the ſummer-time.

Various are the methods uſed for removing theſe calloſities of the ſkin and cuticle; ſome by knife, and others by application of emollient and cauſtic or eroding medicines; but which way ſoever they are removed, it is certainly the beſt to let their hard ſubſtance be firſt ſufficiently mollified; and this may be obtained by frequently macerating them for a conſiderable time in warm water, and afterwards paring off their uppermoſt ſurface with a penknife: or if this does not ſuffice, let a plaſter of green wax, gum ammoniac. de ſaphon. &c. or a leaf of houſe-leek be applied and renewed every day; when theſe applications have been continued for ſome time, peel them away with your nails, or ſcrape them with a ſcalpel, but with great caution, to avoid injuring any of the ſubjacent tendons of the extenſor muſcle, which might occaſion violent pains, inflammation, convulſions, a gangrene, and even death; all which have alſo been frequently the conſequences of cauſtics penetrating to thoſe parts.

CORNAGE, an ancient tenure, the ſervice whereof was to blow a horn when any invaſion of the Scots was perceived.

CORNEA TUNICA, in anatomy, the ſecond coat of the eye, ſo called from its ſubſtance, which reſembles the horn of a lanthorn. See the article EYE.

The cornea is convex, pellucid, and diviſible into various lamellæ. It is ſituated in the fore-part of the eye, and ſurrounded by the ſclerotica. It has a moſt exquiſite ſenſe, to the end that the tears, upon the leaſt pain, may be ſqueezed out of the lachrymal gland, to waſh off any filth, which, by ſticking to the cornea, might render it dim.

CORNEL-TREE, *Cornus*, in botany. See the article CORNUS.

CORNELIAN, *Sarda*, the ſame with carnelian. See CARNELIAN.

CORNER, *Angulus*, in a general ſenſe, the ſame with angle. See ANGLE.

CORNER-TEETH *of a Horſe*, the four teeth between the middle teeth and the tuſhes, being two above and two below, in each ſide of the jaw, which ſhoot forth when the horſe is four years and a half old.

CORNET, in the military art of the ancients, an inſtrument much in the nature of a trumpet, which, when it only ſounded, the enſigns were to march alone, without the ſoldiers; whereas, when the trumpet only ſounded, the ſoldiers were to move without the enſigns.

CORNET, in the military art of the moderns, the third commiſſion officer in a troop of horſe or dragoons.

This is a very honourable poſt: he commands in the lieutenant's abſence; his principal duty being to carry the ſtandard near the middle of the firſt rank of the ſquadron.

CORNICHE, CORNISH, or CORNICE, in architecture, the uppermoſt member of the entablature of a column, as that which crowns the order. The corniche is the third grand diviſion of the trabeation, commencing with the frieze, and ending with the cimatim. The corniche is different in different orders, there being as many kinds of corniches as there are different orders of columns. It is moſt plain in the Tuſcan order. Vignola makes it conſiſt of an ovum or quarter-round, an aſtragal or baguette, the reglet or fillet, the larmier, and the talon.

In the Ionic, the members are in moſt reſpects the ſame in the Doric, except that they are frequently enriched with carvings, and have always dentils.

In the Doric, Vignola makes the capitals of the triglyphs of the frieze, with their bandeletters, a talon, mutules or dentils, a larmier with its guttæ underneath, a talon, fillet cavetto, and reglet.

The Corinthian corniche is the richeſt, and is diſtinguiſhed by having both modillions and dentils, contrary to the opinion of Vitruvius, who looks upon theſe two ornaments as incompatible; and of Mr. Le Clerc, who accounts the dentils as peculiar to the Ionic.

In the Compoſite there are dentils, its mouldings carved, and there are channels under the ſoffit.

CORNICHE is alſo uſed, in general, for all little projectures in maſonry or joinery, even where there are no columns, as the corniche of a chimney, beaufet, &c.

Architrave-CORNICHE, that immediately contiguous to the architrave, the frieze being retrenched.

Mutilated CORNICHE, one whoſe projecture is cut, or interrupted to the right of the larmier: or reduced into a plat-band, with a cimatium.

Cantaliver CORNICHE, a term uſed by workmen for a corniche that has cantalivers underneath.

Coving-CORNICHE, that which has a great caſement or hollow in it, ordinarily lathed and plaſtered upon compaſs-ſprechets, or brackets.

Modillion-CORNICHE, one with modillions under it.

CORNICHE is alſo uſed for the crownings of pedeſtals.

CORNICULARIS PROCESSUS, the proceſs or knob of the ſhoulder bone, called thus becauſe it reſembles the figure of a crow's beak.

CORNICULARIUS, in Roman antiquity, an officer of the army, appointed to aſſiſt the military tribune in quality of lieutenant.

CORNICULATE, or CORNICULATED FLOWER, one with a ſharp-pointed appendage, reſembling, in ſome degree, a cock's ſpur.

CORNICULATE PLANTS, the ſame with ſiliquoſe plants with horned pods, or ſeed-veſſels.

CORNISH, or CORNICHE, in architecture. See the article CORNICHE.

CORNU AMMONIS, or HAMMONIS, in natural hiſtory, a genus of foſſil ſhells, called ſerpent-ſtones, or ſnake-ſtones, by the vulgar.

They are found of all ſizes, from the breadth of a ſix-pence, to more than two feet in diameter; ſome of them rounded, others greatly compreſſed, and lodged in different ſtrata of ſtones and clays; ſome again are ſmooth, and others ridged in different manners, their ſtriæ and ridges being either ſtraight, irregularly crooked, or undulated.

CORNUCOPIA, or HORN *of Plenty*, among painters, &c. is repreſented under the figure of a large horn, out of which iſſues fruits, flowers, &c. Upon medals the cornucopia is given to all deities, genii, and heroes, to mark the felicity and abundance of all the wealth procured by the goodneſs of the former, or the care and valour of the latter.

CORNUCOPIÆ, in botany, a genus of plants, producing a flower, the corolla of which is univalicular, and contains three capillary filaments, topped with oblong antheræ; the germen is turbinated, and ſupports two hairy ſtyles; it has no pericarpium, but the corolla incloſes a ſingle turbinated ſeed, convex on one ſide and plane on the other.

CORNUS, the cornel tree, in botany, a genus of plants, whoſe flowers come out in bunches, placed on a general involucrum, which is coloured; each flower conſiſts of four oblong, acute, plane petals, with four erect ſtamina. The fruit is a roundiſh umbilicated drupe, incloſing a cordated or oblong nut with two cells, having an oblong kernel. There are different ſpecies of cornus, one of which is known by the name of cornelian cherry. This tree is moderately tall with many irregular branches; the trunk is covered with a pale brown bark, and the young twigs are of a bloody purple; the leaves are oblong, conſiderably broad and ribbed, with high veins; it flowers early in the ſpring before the leaves appear, and are placed on the extremities of the branches. It is propagated in the nurſeries as a flowering ſhrub, on account of the early appearance of the flowers. The fruit is ripe in September, and are preſerved by many for the making of tarts; when full ripe they are of a ſweetiſh acid, and are reckoned cooling, drying, and aſtringent, for which reaſon they are preſcribed againſt fluxes of all kinds, and are good in fevers, eſpecially if attended with a diarrhæa.

COROLLA, among botaniſts, the moſt conſpicuous, and in general the moſt beautiful part of a flower. This is the termination of the liber or inner bark, continued to, and accompanying the fructification in this new form of painted leaves, moſt commonly called petals, by which appellation they are diſtinguiſhed from the green leaves of the plant. Its uſe is the ſame as that of the calyx, ſerving more immediately to protect the generative parts, as the calyx, which is uſually of a ſtronger texture, covers the whole. According as there is one, two, or three of theſe petals, the corolla is ſaid to be monopetalous, dipetalous, tripetalous, &c. but in ſome flowers the corolla is wanting, which are then ſaid to be apetalous.

COROLLARY is an uſeful conſequence drawn from ſomething already advanced or demonſtrated: thus, it being demonſtrated that a triangle which has two equal ſides, has alſo two angles equal; this corollary will follow, that a triangle which has three ſides equal, has alſo its three angles equal.

COROLLISTS, *Corolliſtæ*, an appellation given by Linnæus to thoſe botaniſts who have arranged plants under diſtinct claſſes, according to the different form of their corollæ or flowers; ſuch is the celebrated Tournefort and Rivinus.

COROLLULA, a term uſed by botaniſts, to expreſs little partial flowers, which together make up the compound ones.

Theſe corollulæ are of two kinds, the tubulated and ligulated; the former whereof are always furniſhed with a campanulated limb, divided into four or five ſegments; and the latter have only a flat linear limb, terminated by a ſingle point, or by a broader extremity, divided into three or five ſegments. See FLOWER.

CORONA, CROWN, or CROWNING, in architecture. See CROWNING.

CORONA, among anatomiſts, denotes that edge of the glans penis where the preputium begins.

CORONA, among botaniſts, expreſſes any thing growing on the head of a ſeed.

Theſe coronæ are of various kinds: ſometimes ſimple, conſiſting only of a dentated membrane; ſometimes pappoſe, conſiſting of downy matter, which in ſome caſes is immediately affixed to the ſeed; in others it has a pedicle growing from it; and it ſometimes is compoſed of ſimple filaments, and ſometimes is ramoſe. Hence, in the deſcription of the ſeeds of plants, they are frequently ſaid to be crowned or winged with down; the uſe of this part being evidently to ſcatter and diſperſe the ſeeds, when ripe.

CORONA BOREALIS, in aſtronomy, is a conſtellation in the northern hemiſphere, ſituated between Bootes and Hercules, near the head of Serpens. The poets tell us, this was the crown or garland that Venus gave to Ariadne when ſhe was married to Bacchus, in the iſle of Naxus, after Theſeus had forſaken her; and afterwards Bacchus placed this crown in heaven in token of his love. Novidius will have it to be the crown of the Virgin Mary. The ſtars in this conſtellation, according to Ptolemy's catalogue, are eight, Tycho's the ſame, and in the Britiſh twenty-one; their right aſcenſion, declination, variation, &c. are as follows.

Order

Order.	Magn.	Name.	Bayer Let.	Right Aſcenſion	Diſtance from Nor. Pole.	Var. in Right Aſcen.	Var. in Declination.
				° ′ ″	° ′ ″	″	″
1	6		ϱ	227.33.21	59.29.50	36.2	13.5
2	5		γ	228.18.34	58.50. 8	36.0	13.2
3	4		β	229.28.18	60. 3.27	36.2	13.0
4	4.5		θ	230.48.38	57.49.15	35.9	12.8
5	2.3		α	231. 8.25	62.28. 8	38.5	12.6
6	5		μ	231.37.49	50.11.34	31.0	12.0
7	4		ζ	232.38.59	52.34.29	36.0	11.9
8	4		γ	233.10.20	62.55.58	38.0	11.8
9	5		π	233.38.56	56.42.55	37.5	11.6
10	4		σ	234.53.13	63. 6. 2	38.5	11.5
11	5		κ	235.34. 2	53.34.53	36.2	11.3
12	5		λ	236.46.22	51.20.45	35.2	11.0
13	4.5		ε	236.54.47	62.25. 0	37.0	11.7
14	5.6		ι	237.57.39	59.28.17	36.7	11.2
15	6		ϱ	237.58.52	55.57. 6	34.0	10.8
16	6		τ	240. 4.34	52.54. 7	43.5	10.2
17	6		σ	241.29.22	55.38. 4	34.5	9.5
18	6		υ	241.46.33	60.21.25	35.7	9.4
19	5		ξ	243.11.34	58.39.26	35.2	9.0
20	5	1ma ad	ν	243.21.23	55.44.28	35.0	8.8
21	5	2da ad	ν	250.28.42	56. 0.25	34.5	6.7

CORONA AUSTRALIS, in aſtronomy, a conſtellation of the ſouthern hemiſphere, between the fore legs of Sagittarius. The opinion of the poets are various concerning this crown: ſome ſay this is the crown that was given to Sagittarius by the gods, and which he was wont to wear; but one day caſting it from him out of giddineſs, or with great indifferency, it gave ſuch offence to the donors, that they placed it betwixt his fore legs, for a chaſtiſement for his behaviour, and a memento for others, not to deſpiſe or think triflingly of the gifts of their ſuperiors. Others, call it the wheel of Ixion, thinking it to be that wheel on which he was tortured for his attempt on Juno's virtue, for which impudence Jupiter hurled him down from heaven into hell, where this puniſhment was inflicted; but afterwards the wheel was made a conſtellation, to betoken to mortal man, the great ſin he commits who attempts the virtue of another man's wife.

CORONAL, *Coronalis*, in anatomy, the firſt ſuture of the ſkull. See the articles SUTURE and SKULL.

This ſuture reaches tranſverſely from the one temple to the other, and joins the os frontis with the oſſa parietalia.

CORONALE OS, in anatomy, the ſame with the os frontis. See FRONTIS.

CORONARY VESSELS, *Vaſa Coronaria*, in anatomy, certain veſſels which furniſh the ſubſtance of the heart with blood.

CORONARY ARTERIES, are two arteries ſpringing out of the aorta, before it leaves the pericardium.

CORONARY VEIN, a vein diffuſed over the exterior ſurface of the heart. It is formed of ſeveral branches ariſing from all parts of the viſcus, and terminates in the vena cava, whither it conveys the remains of the blood brought by the coronary arteries.

Stomachic CORONARY, a vein inſerted into the trunk of the ſplenic vein, which, by uniting with the meſenteric, forms the vena porta. See the article PORTA.

CORONE, in anatomy, the anterior apophyſis of the lower jaw. See JAW.

CORONER, an ancient officer of the kingdom, ſo called, becauſe he is wholly employed for the king and the crown.

CORONET. See the article CROWN.

CORONET, or CRONET *of a Horſe*, the loweſt part of the paſtern, which runs round the coffin, and is diſtinguiſhed by the hair joining and covering the upper part of the hoof.

CORONILLA, in botany, a genus of plants, whoſe flower is papilionaceous; the vexillum cordated, bent backwards, and ſcarce longer than the alæ, ſtanding in cluſters at the top of the branch; the fruit is a taper jointed pod, incloſing ſeveral ſeeds.

CORPORA CAVERNOSA, in anatomy. See the article CAVERNOSE.

CORPORA OLIVARIA, two protuberances of the medulla oblongata. See the article BRAIN.

CORPORA PYRAMIDALIA, two protuberances of the under part of the cerebellum, ſo called from their reſemblance of a pyramid.

CORPORA STRIATA, two protuberances in the lateral ventricles in the brain. See the article BRAIN.

CORPORAL of a ſhip of war, an officer under the maſter at arms, employed to teach the ſailors the exerciſe of ſmall arms, or muſketry, to attend at the gangway, or entering ports, and obſerve that no ſpirituous, or intoxicating liquors, are brought aboard, unleſs for the officers, or by their leave: ſome of the ſea-nymphs however, who are dextrous at conveyances of this kind, often elude their ſearch, by concealing quantities of gin, &c. in bladders ſo cautiouſly, that the corporal's modeſty, though but little, relieves theſe ladies from a cloſer ſcrutiny.

The corporal is alſo to extinguiſh the fire and candle at eight o'clock in winter, and nine in ſummer, at which time the gun is fired, and to walk down in the lower-decks, once or twice in an hour, to ſee that there are no lights but ſuch as are under charge of proper centinels.

CORPORAL, an inferior officer under a ſerjeant, in

in a company of foot, who has charge over one of the diviſions, places and relieves centinels, and keeps good order in the corps de garde: he alſo receives the word from the inferior rounds, which paſſes by his corps de garde: there are generally three corporals in each company.

CORPORAL, *Corporale*, in the Chriſtian church, a name for the linen cloth thrown over the conſecrated elements at the celebration of the euchariſt.

CORPORATION, a body politic, or incorporate, ſo called, becauſe the perſons or members are joined into one body, and are qualified to take and grant, &c.

CORPOREAL, thoſe qualities which denominate a body.

CORPOSANT, COMPOZANT, or COMPOSANT, a ſort of volatile meteor, or *ignis fatuus*, often ſeen about the decks or rigging of a ſhip, but particularly the extremities, as the maſt-heads and yard-arms, in a violent ſtorm, accompanied with rain and a dark night. We have ſeen three of theſe at once in ſuch a ſituation ourſelves, when the leaſt glimmer of light could not be diſcovered any where elſe. By ſome theſe are called Caſtor and Pollux. See CASTOR, &c.

CORPS DE GARDE, a poſt in an army, ſometimes under covert, ſometimes in the open air, to receive a number of ſoldiers, who are relieved from time to time, and are to watch in their turns, for the ſecurity of ſome more conſiderable poſt.

Corps de garde is frequently uſed for the men who watch in this poſt.

CORPS DE BATAILLE, the main body of an army, drawn up in order of battle. See the articles ARMY and GUARD.

CORPS, in architecture, a term to ſignify any part that projects or advances beyond the nakedneſs of a wall, ſerving as a ground for ſome decoration, or the like.

CORPULENCY, in medicine, the ſtate of a perſon too much loaded with fleſh or fat.

CORPUS CALLOSUM, a medullary part of the brain, which covers the whole lateral ventricles. See the article BRAIN.

CORPUS CAVERNOSUM, a cavernous ſubſtance ſurrounding the vagina, which ſwells in the time of coition.

CORPUS PAMPINIFORME, a body formed a little above the teſticles, by the diviſion and reunion of the ſpermatic veins.

CORPUS is alſo uſed, in matters of literature, for ſeveral works of the ſame nature, collected together in the form of a ſyſtem of any art or ſcience.

CORPUS CHRISTI, a feſtival of the church, kept on the next Thurſday after Trinity-Sunday, inſtituted in honour of the euchariſt; to which alſo one of the colleges in Oxford is dedicated.

CORPUSCLE, in phyſics, a minute particle, or phyſical atom, being ſuch as compoſe a natural body. By this word is not meant the elementary particles, nor the hypoſtatical principles of chemiſts; but ſuch particles, whether of a ſimple or compound nature, whoſe parts will not be diſſolved nor diſſipated by ordinary degrees of heat. Sir Iſaac Newton, in the ſecond book of his Optics, ſhews a way of gueſſing, with great accuracy, at the ſize of the component corpuſcles of bodies. See COLOUR.

CORPUSCULAR PHILOSOPHY, that way of philoſophiſing which endeavours to explain things, and to account for the phænomena of nature by the motion, figure, reſt, poſition, &c. of the corpuſcles, or the minute particles of matter. See the article ATOMICAL PHILOSOPHY.

This philoſophy is ſo very ancient, that, both before Epicurus and Democritus, and even before Leucippus taught in Greece, there was a Phœnician philoſopher, who explained natural phænomena by the motions and affections of the minute corpuſcles of matter, as very old writers inform us: and, therefore, it ſhould rather be called Phœnician philoſophy, than Epicurean.

Mr. Boyle ſums up the chief principles of the corpuſcular hypotheſis, which now flouriſhes under the mechanical philoſophy, in theſe particulars:

1. They ſuppoſe that there is but one catholic or univerſal matter, which is an extended, impenetrable, and diviſible ſubſtance, common to all bodies, and capable of all forms. 2. That this matter, in order to form the vaſt variety of natural bodies, muſt have motion in ſome or all its aſſignable parts; and that this motion was given to matter by God, the creator of all things, and has all manner of directions and tendencies. 3. Matter muſt alſo be actually divided into parts, and each of theſe primitive particles, fragments, or atoms of matter, muſt have its proper magnitude or ſize, as alſo its peculiar figure or ſhape. 4. They ſuppoſe alſo that theſe differently ſized and ſhaped particles may have as different orders and poſitions, whereof great variety may ariſe in the compoſition of bodies.

CORRECTION, in printing, implies the pointing out, or diſcovering the faults of a printed ſheet, in order to their being amended by the compoſitor before it is printed off. See PRINTING.

The corrections are placed on the margin of every page, right againſt the line wherein the faults are found; and there are different characters uſed to expreſs different corrections: thus ℔ is put for *dele*, to intimate that ſomething, as a point, letter, word, &c. daſhed in that line, is to be taken out. If any thing is to be inſerted, the place is to be marked thus ʌ, and the thing to be inſerted added in the margin. When there are two or more corrections in the ſame line, then they are all ſeparated in the margin by little bars thus |. If a ſpace be omitted, its place is marked with a caret, and the

margin thus ⋕. When a letter is inverted, it is expressed in the margin thus ☽. When any thing is to be transposed, it is directed thus, *Extraordinary scarce ever fail of attainments exciting envy*, for *Extraordinary attainments scarce ever fail of exciting envy*, and in the margin is added *tr.* If Italic characters are to be changed for Roman, or *vice versa*, a line is drawn thus——under the letters, and *rom.* or *ital.* is written in the margin. If a space, or n or m quadrat, stick up, and print black, it is marked in the margin with a dash, thus |. If a word, sentence, or paragraph is entirely omitted, the place is marked with a caret, and in the margin is put the word *out.* If the letters of a word stand too far asunder, a line is drawn under them, and in the margin is put a crooked line or hook, thus ◡. There are many other marks used in correcting, as √ for superior, *cap.* for capital, *l. c.* for lower-case, *&c.*

CORRECTION, in the manege, signifies aids given with severity.

CORRECTION, in pharmacy, the adding some ingredient to a composition, in order to check or moderate the violence of the operation.

CORRECTION, in rhetoric. See EPANORTHOSIS.

CORRECTOR, in general, denotes something that mends the faults or bad qualities of others.

CORRECTOR *of the Staple*, a clerk belonging to the staple, whose business is to write down and record the bargains that merchants make there.

CORRECTOR, in medicine and pharmacy, an ingredient in a composition, which guards against or abates the force of another.

Thus the lixivial salts prevent the grievous vellications of resinous purges, by dividing their particles, and preventing their adhesions to the internal membranes, whereby sometimes they occasion intolerable gripings: and thus spices and carminative seeds also assist in the easier operation of some cathartics, by dissipating collections of wind. In the making a medicine, such a thing is also called a corrector, as destroys or diminishes a quality in it, that could not otherwise be dispensed with: thus turpentine may be called the corrector of quicksilver, by destroying its fluxity, and making it thereby capable of mixture; and thus rectified spirit of wine breaks off the points of some acids, so as to make them become safe and good remedies which before were destructive.

CORRELATIVE, something opposed to another in a certain relation. Thus, father and son are correlatives. Light and darkness, motion and rest, are correlative and opposite terms.

CORRIGIOLA, in botany, a genus of plants, whose corolla consists of five ovated patent petals, with the same number of subulated filaments top'd with simple antheræ; it hath no pericarpium, but the cup, which is pentaphyllous, containing a single ovated triangular seed.

CORROSION, in a general sense, the action of gnawing away, by degrees, the continuity of the parts of bodies.

CORROSION, in chemistry, an action performed on bodies, by means of proper menstruums, that produce new combinations, and a change of their form, without converting them to fluidity. See the article MENSTRUUM.

CORROSIVES, in surgery, are medicines which corrode whatever part of the body they are applied to: such are burnt-alum, white precipitate of mercury, white vitriol, red precipitate of mercury, butter of antimony, lapis infernalis, &c.

CORRUGATOR, in anatomy, a muscle which arises fleshy from the process of the os frontis, next the inner or great angle of the orbit, above the joining of the os nasi and the superior process of the os maxillare with this bone: from thence it runs obliquely outwards and upwards, and is inserted into the fleshy part of the occipito-frontalis, some of its fibrillæ passing through into the skin, a little higher than the middle region of the eyebrows.

Its use is to smooth the skin of the forehead, by pulling it down after the action of the occipito-frontalis; and when it acts most forcibly, it serves to wrinkle the skin of the front between the supercilia, as it happens when we frown, or knit the brows.

CORRUPTICOLÆ, in church history, a sect of heretics, so called from their maintaining that the body of Christ was corruptible, that the fathers had owned it, and that to deny it was to deny the truth of our Saviour's passion.

CORRUPTION, the destruction, extinction, or, at least, cessation for a time, of the proper mode of existence of any natural body.

CORRUPTION *of blood*, in law, an infection accruing to a man's state, attainted of felony and treason, and to his issue; for as he loses all to the prince, &c. his issue cannot be heirs to him, or to any other ancestor by him: and if he were noble, his heirs are rendered ignoble.

CORSAIR, in the marine, a name given to the piratical cruisers of Barbary, who frequently plunder the merchant-ships of countries with whom they are at peace.

CORSELET, a little cuirass; or, according to others, an armour or coat made to cover the whole body, anciently worn by the pike-men, usually placed in the fronts and flanks of the battle, for the better resisting the enemy's assaults, and guarding the soldiers placed behind them.

CORTEX, bark, in botany; see BARK.

CORTEX *Peruvianus.* See QUINQUINA.

CORTEX *Winteranus.* See WINTERANUS *Cortex.*

CORTICAL, in a general sense, implies something consisting of, or resembling bark. Thus the cortical part of the brain is that which invests the internal

ternal or medullary part, like the bark of a tree. See BRAIN.

CORTUSA, in botany, a genus of plants, the flower of which conſiſts of a monopetalous rotated corolla, and contains five obtuſe ſtamina. The fruit is an ovato-oblong pointed capſule, furrowed longitudinally on each ſide with valves, having their ſides involuted, and one cell containing a number of obtuſe oblong ſmall ſeeds.

CORUSCATION, a glittering, or gleam of light iſſuing from any thing.

CORVUS, the raven in ornithology, a genus of birds of the order of the picæ, the diſtinguiſhing character of which is, that the beak is of a convex and cultrated figure, the mandibles nearly equal, and the baſe beſet with hairs.

CORVUS, in aſtronomy, a conſtellation of the ſouthern hemiſphere. The fabulous hiſtory is this: Apollo making a great entertainment for Jupiter, and after much mirth and feaſting (being all joyous ſouls) he found he ſhould want water, or not have a ſufficiency for his preſent entertainment; whether this water was wanted among the gods to mingle with their wine, or to incorporate with any other divine liquor, we are not able to judge. However Apollo gave a cup to the crow (his favourite bird) and ſent him to fetch water therein; but the crow, in his flight towards the river, eſpied a fig-tree, to which he directed his courſe, and found the figs not yet ripe: however he would not depart till they were; and after having ſatisfied his longing, he bethought himſelf of his errand, and what excuſe he ſhould make to Apollo for his long delay. At laſt ſeeing a ſnake, he took it up in his bill, carried it to Apollo, and told him it would not let him fill the cup; for which frivolous excuſe, Apollo decreed that the bird ſhould never drink while the figs were unripe on the tree, and as a memorial placed the crow, cup, and ſnake in heaven.

There are nine ſtars in this conſtellation according to the Britiſh catalogue; their right-aſcenſion, declination, &c. as follow, viz.

Order.	Magn.	Name.	Bayer Let.	Right Aſcenſion	Diſtance from Nor. Pole.	Var. in Right Aſcen	Var. in Declination.
			α	° ′ ″	° ′ ″	″	″
1	4		ε	178. 0.59	113.23.30	46.0	20.0
2	4			179.27.39	111.10.10	46.1	20.0
3	6		γ	179.40.59	112.15.55	46.1	20.0
4	3		ξ	180.53. 9	106.12.30	46.2	20.0
5	5			182. 2.39	110.52.55	46.2	20.0
6	6		δ	182.43. 2	113.30.25	46.2	20.0
7	3			184.23. 2	105.10.27	46.6	20.0
8	5		κ	184.55.48	104.51.52	46.7	20.0
9	3		b	185.27.36	112. 4.13	46.9	20.0

CORVUS, in Roman antiquity, a military engine chiefly uſed in boarding the enemy's ſhips.

CORYBANTES, in antiquity, prieſts of the goddeſs Cybele, who inſpired with a ſacred fury, danced up and down, toſſing their heads, and beating on cymbals, or brazen drums. They inhabited Mount Ida, in the iſland of Crete, where they nouriſhed the infant Jupiter.

CORYLUS, the hazle, or nut-tree, in botany. See HAZLE.

CORYMBYFROUS *Plants*, in botany, are ſuch as have a compound diſcous flower, but their ſeeds deſtitute of down. They bear their flowers in cluſters, ſpreading round in the form of an umbrella. Of this kind are the common marygold, common daiſy, camomile, &c.

CORYMBUS, among botaniſts, cluſters of berries, as thoſe of ivy, &c. It is alſo uſed by the modern botaniſts, to ſignify a compound diſcous flower, which does not fly away in down.

CO-SECANT, in geometry, is the ſecant of the complement of any given arch to ninety degrees.

COSMETIC, in medicine, implies a preparation for ſoftening and whitening the ſkin.

COSMICAL, in aſtronomy, is one of the poetical riſings or ſettings of a ſtar; which is ſaid to riſe coſmically, when it riſes with the ſun, or with that point of the ecliptic, in which the ſun is at that time; and the coſmical ſetting of a ſtar, is when it ſets at ſun riſing.

COSMOGRAPHY, a deſcription of the ſeveral parts of the viſible world; and conſiſts of two parts, aſtronomy and geography.

The word is Greek, κοσμογραφια, and compounded of κοσμος, the world, and γραφω, to deſcribe.

COSMOPOLITE, a citizen of the world, or one who has no fixed reſidence.

COSSE, or COSSIC, a word uſed, by old writers, for algebra.

COSSET, among farmers, implies a colt, calf, lamb, &c. brought up by hand, without the dam.

COSTAL, an epithet applied by anatomiſts to ſeveral parts belonging to the ſides.

COSTIVENESS, among phyſicians, a preternatual detention of the fæces, with an unuſual dryneſs and hardneſs thereof.

The moſt effectual method of removing obſtructions of this kind, are gentle purgatives; ſuch as the purging ſalts, manna, lenitive electuary, and emollient clyſters.

COSTMARY, in botany, a ſpecies of tanſey; it grows naturally in the ſouth of France and Italy, but is here planted in gardens, and flowers in Auguſt. Its roots are hard, long, ſtringy, and creep in the ground like thoſe of mint; the leaves are oblong, of a paliſh colour, and dentated on their edges; the flowers are produced on the top of

the ſtalks in a looſe corymbus, and are of a deep yellow.

The leaves are chiefly uſed in medicine, and are ſtomachic, cephalic, carminative, and deobſtruent; they are alſo externally applied in fomentation and bathing, to ſtrengthen the joints.

COSTS, in law, imply the expences of a ſuit recovered by the plaintiff together with damages.

COSTUME, a rule or precept in painting, by which the artiſt is enjoined to make every perſon and thing ſuſtain its proper character, and not only obſerve the ſtory, but the circumſtances, the ſcene of action, the country or place, and take care that the habits, arms, manners, proportions, and the like, exactly correſpond.

COSTUS, in botany, a plant which hath a fleſhy jointed root, which propagates under the ſurface of the ground like that of ginger. From the root ariſe many round taper herbaceous ſtalks, which are furniſhed with oblong ſmooth leaves, embracing the ſtalk like thoſe of the reed; theſe riſe about two feet high, and from the center the head of the flowers are produced, which is near two inches long, blunt at the top, and compoſed of ſeveral leafy ſcales, out of which the flowers come; each of theſe have but one thin white petal, which is of ſhort duration. The time of its flowering here is quite uncertain. It is propagated by parting the roots in the ſpring; but being a native of Eaſt India, it requires a ſtove to preſerve it in this climate.

The roots of this plant were formerly imported from India, and were much uſed in medicine; but of late years they have not been regarded, the roots of ginger being generally ſubſtituted in their ſtead.

COTESIAN *Theorem*, an appellation given to a remarkable property of the circle diſcovered by Mr. Cotes, of great uſe in finding the fluents to a vaſt number of fluxions: the demonſtration and application of which may be ſeen in moſt books on fluxions, but in our opinion, no where ſo elegantly done as in the treatiſe publiſhed by the late Mr. Simpſon.

COTHURNUS, the buſkin. See BUSKIN.

COTICE, or COTISE, in heraldry, is the fourth part of the bend; and, with us, is ſeldom, if ever, borne but in couples, with a bend between them.

COTTAGE, a ſmall houſe, without lands belonging to it.

COTTON, in commerce, a ſoft downy ſubſtance, growing on a tree called goſſypium by botaniſts. See GOSSYPIUM.

Cotton is ſeparated from the ſeeds of the plant by a mill, and then ſpun and prepared for all ſorts of fine works, as ſtockings, waiſtcoats, quilts, tapeſtry, curtains, &c. With it they likewiſe make muſlin, and ſometimes it is mixed with wool, ſometimes with ſilk, and even with gold itſelf.

Lavender COTTON, a name by which ſome call the ſantolina of authors. See the article SANTOLINA.

COTULA, in botany, a genus of plants whoſe flower is compounded, a little convex, and radiated. The hermaphrodite florets, which compoſe the diſk, are very numerous and tubuloſe, with the limb divided into four ſegments: theſe have four ſmall ſtamina; and the ſeeds are ſolitary, ſmall, and trigonal. The female florets, which compoſe the rays, have an oval compreſſed germen, which is ſucceeded by ſingle cordated ſeeds.

COTULA, or COTYLA, in antiquity, a liquid meaſure among the Greeks, equal to the hemina of the Romans, containing half a ſextary, or four acetabula: hence it appears, that it contained ten ounces of wine, and nine of oil.

COTURNIX, the quail, in ornithology, a ſpecies of tetrao, with the line of the eye-brows white; ſaid to be the leaſt bird of the whole order of the gallinæ.

It is about the ſize of the fieldfare, and is eſteemed at table.

COTYLA, in anatomy, implies any deep cavity in a bone, in which any other bone is articulated: but it is generally uſed to expreſs the acebulum, or cavity which receives the head of the thigh-bone.

It alſo imports a deep ſinus ſurrounded with large lips.

COTYLEDON, navel-wort, in botany, a genus of plants, the flower of which is compoſed of a campanulated ſingle petal, cut into five ſegments at the brim, which are reflected. The fruit conſiſts of five oblong, ventricoſe, acuminated capſules, each formed of a ſingle valve, and opening longitudinally inwards. The ſeeds are numerous and ſmall.

There are divers ſpecies of cotyledon, which are all natives of foreign countries, except one ſort, which grows naturally in the weſt of England; the leaves of which are ſaid to be good in external inflammations; and are ſometimes ſubſtituted inſtead of houſeleek.

COTYLEDONES, in anatomy, are certain glandular bodies, adhering to the chorion of ſome animals: but no ſuch ſubſtances are obſervable in human bodies, the placenta in the womb ſupplying the place thereof in women. See the article PLACENTA.

COUCH, in painting, a phraſe uſed for each lay or impreſſion of colour, either in oil or water, wherewith the painter covers his canvas, wainſcot, or other matter to be painted.

COUCH, or WET-COUCH, in malt-making. See the article MALT-MAKING.

COUCH-GRASS, in botany. See the article AGROSTIS.

COUCHANT, in heraldry, is underſtood of a lion, or other beaſt, when lying down, but with his

his head raiſed, which diſtinguiſhes the poſture of couchant from dormant, wherein he is ſuppoſed quite ſtretched out and aſleep.

COUCHE, in heraldry, ſignifies any thing lying along: thus, chevron couche, is a chevron lying ſideways, with the two ends on one ſide of the ſhield, which ſhould properly reſt on the baſe.

COUCHING, among ſportſmen, denotes the lodging of a boar. See BOAR.

COUCHING *of a Cataract*, in ſurgery, one of the two chief methods of curing a cataract, by couching with the needle. See the article CATARACT.

COVENANT, a compact or agreement made between two or more perſons, to perform ſomething.

COVENTRY-BELLS, in botany, a name ſometimes uſed for the campanula. See the article CAMPANULA.

COVERING, or ROOFING, in architecture. See the article ROOF.

CO-VERSED SINE, in geometry, the remaining part of the diameter of a circle, after the verſed ſine is taken from it. See the article VERSED SINE.

COVERT-WAY, or CORRIDOR, in fortification, a ſpace of ground upon the edge of the ditch level with the field. It is covered with a parapet, together with its banquets and glacis, ranging quite round the half-moon, and other works towards the country.

COVERTURE, in law, is applied to the ſtate and condition of a married woman, who is under the power of her huſband, and therefore called *feme covert*; and diſabled to contract with any perſon to the detriment of herſelf or huſband, without his conſent and privity; or allowance and confirmation thereof.

COUGH, *Tuſſis*, in medicine, a convulſive motion of the diaphragm, muſcles of the larynx, thorax, and abdomen, violently ſhaking, and expelling the air that was drawn into the lungs by inſpiration.

COVIN, among lawyers, a deceitful compact between two or more to deceive or prejudice another perſon.

COVING, in building, is when houſes are built projecting over the ground-plot, and the turned projecture arched with timber, lathed and plaſtered.

COULTER, in huſbandry, an iron inſtrument, fixed in the beam of a plough, and ſerving to cut the edge of each furrow. See the article PLOUGH.

COUNCIL, or COUNSEL, in a general ſenſe, an aſſembly of divers conſiderable perſons to concert meaſures relating to the ſtate.

Privy COUNCIL, the primum mobile of the civil government of Great-Britain, bearing part of that great weight in the government which otherwiſe would be heavy upon the king.

It is compoſed of eminent perſons, the number of whom is at the ſovereign's pleaſure, who are bound by oath to adviſe the king to the beſt of their judgment, with all the fidelity and ſecrecy that becomes their ſtation. The king may declare to, or conceal from, his privy council whatever he thinks fit, and has a ſelect council out of their number commonly called the cabinet council, with whom his majeſty determines ſuch matters as are moſt important, and require the utmoſt ſecrecy. All proclamations from the king and the privy-council ought to be grounded on law, otherwiſe they are not binding to the ſubject.

Privy-counſellors, though but gentlemen, have precedence of all the knights and younger ſons of barons and viſcounts, and are ſtiled right honourable.

COUNCIL *of War*, an aſſembly of the principal officers of an army or fleet, occaſionally ſummoned by the general or admiral to concert meaſures for their conduct in any hoſtile enterprize. It is not much to the advantage of a ſtate to have too many councils of war.

Councils of war are alſo ſometimes called when the officers have no inclination to land on an enemy's coaſt; in this caſe they find it neceſſary to foreſee great danger in the attempt.

COUNCIL, in church hiſtory, an aſſembly of prelates and doctors met for the regulating matters relating to the doctrine, or diſcipline, of the church.

National COUNCIL, is an aſſembly of prelates of a nation under their primate or patriarch. See PRIMATE, &c.

Oecumenical or *general* COUNCIL, is an aſſembly which repreſents the whole body of the univerſal church. The Romaniſts reckon eighteen of them; Bullinger, in his treatiſe de Conciliis, ſix; Dr. Prideaux, ſeven; and biſhop Beveridge has increaſed the number to eight, which, he ſays, are all the general councils which have ever been held ſince the time of the firſt Chriſtian emperor. They are as follows: The council of Nice, held in the reign of Conſtantine the Great, on account of the hereſy of Arius. 2. The council of Conſtantinople, called under the reign, and by the command of Theodoſius the Great, for much the ſame end that the former council was ſummoned. 3. The council of Epheſus, convened by Theodoſius the Younger, at the ſuit of Neſtorius. 4. The council of Chalcedon, held in the reign of Martianus, which approved of the Eutychian hereſy. 5. The ſecond council of Conſtantinople, aſſembled by the emperor Juſtinian, condemned the three chapters taken out of the books of Theodorus of Mopſueſtia, having firſt decided that it was lawful to anathematize the dead. Some authors tell us, that they likewiſe condemned the ſeveral errors of Origen about the Trinity, the plurality of worlds, and the pre-exiſtence of ſouls. 6. The third council of Conſtantinople, held by

the command of Conſtantinus Pogonatus the emperor, in which they received the definitions of the five firſt general councils, and particularly that againſt Origen and Theodorus of Mopſueſtia. 7. The ſecond Nicene council. 8. The fourth council of Conſtantinople, aſſembled when Lewis II. was emperor of the weſt. The regulations which they made are contained in twenty-ſeven canons, the heads of which are ſet down by Mr. Du Pin, to whom the reader is referred.

Provincial COUNCIL, an aſſembly of prelates of a province under the metropolitan.

COUNSELLOR, in general, a perſon who adviſes another: thus we ſay, a counſellor at law, a privy counſellor, &c.

COUNSELLOR *at Law*, a perſon retained by a client to plead his cauſe in a public court of judicature.

COUNT, *Comes*, a nobleman who poſſeſſes a domain erected into a county. The dignity is a medium between that of a duke and a baron. See EARL.

COUNT, in law, ſignifies the original declaration in a real action, as a declaration is in a perſonal one.

COUNT-WHEEL, in the ſtriking part of a clock, a wheel which moves round once in twelve or twenty-four hours. It is ſometimes called the locking-wheel. See the article CLOCK.

COUNTER, a term which enters into the compoſition of divers words of our language, and generally implies oppoſition; but when applied to deeds, means an exact copy kept by the contrary party, and ſometimes ſigned by both parties.

COUNTER, in naval architecture, an inward arching under the ſhip's ſtern, to which it is parallel: the upper-part of it is terminated by the bottom of the ſtern, and the lower-part by the buttock. See STERN and BUTTOCK.

COUNTER-APPROACHES, in fortification, lines and trenches made by the beſieged, in order to attack the works of the beſiegers, or to hinder their approaches.

Line of COUNTER-APPROACH, a trench which the beſieged make from their covert-way to the right and left of the attacks, in order to ſcour the enemies works. This line muſt be perfectly enfiladed from the covert-way and the half moon, that it may be of no ſervice to the enemy, in caſe he get poſſeſſion of it.

COUNTER-BARRY, or CONTRE-BARRE, in heraldry, is the ſame as our bendy ſiniſter per bend counterchanged. See the article BARRY.

COUNTER-BATTERY is a battery raiſed to play upon another to diſmount the guns. See the article BATTERY.

COUNTER-BOND, a bond of indemnification given to one who has given his bond as a ſecurity for another's payment of a debt, or the faithful diſcharge of his office or truſt.

COUNTER-BRACING, in the marine. See this operation fully explained in the article TACKING.

COUNTER-CHANGED, in heraldry, is when any field or charge is divided or parted by any line or lines of partition, conſiſting all interchangeably of the ſame tinctures.

COUNTER-CHARGE, a reciprocal charge or recrimination brought againſt an accuſer.

COUNTER-CHEVRONED, a ſhield chevrony, parted by one or more partition lines.

COUNTER-COMPONED, in heraldry, is when the figure is componed of two panes.

COUNTER-DEED, a ſecret writing, either before a notary or under a private ſeal, which deſtroys, invalidates, or alters a public one.

COUNTER-DRAWING, in painting, is the copying a deſign, or painting, by means of a fine linen cloth, an oiled paper, or other tranſparent matter, where the ſtrokes appearing through are followed with a pencil, with or without colour. Sometimes it is done on glaſs, and with frames or nets divided into ſquares with ſilk or with thread, and alſo by means of inſtruments invented for the purpoſe, as the parallelogram.

COUNTER-ERMINE, in heraldry, is the contrary to ermine, being a black field with white ſpots.

COUNTERFEIT-ARCHITECTURE. See the article ARCHITECTURE.

COUNTER-FISSURE. See the article CONTRA-FISSURE.

COUNTER-FACED, or CONTRE-FACE, in heraldry, is the ſame that we call barry per pale counterchanged; but then the number of panes into which the field is divided, is always ſpecified.

COUNTER-FOIL, or COUNTER-STOCK, in the exchequer, that part of a tally which is kept by an officer of the court. See the article TALLY.

COUNTER-FORTS, in fortification, certain pillars and parts of the walls, diſtant from fifteen to twenty feet from each other, which advance as much as may be in the ground, and join to the height of the cordon by vaults, to ſuſtain the chemin de rondes, and part of the rampart, to fortify the wall, and ſtrengthen the ground. See FAUSSE-BRAY.

COUNTER-FUGUE, in muſic, is when the fugues go contrary to one another. See the article FUGUE.

COUNTER-GUARD, or ENVELOPE, in fortification, a mount of earth raiſed ſometimes in the ditch of a place, and ſometimes beyond it, either in form of a ſimple parapet, or a ſmall rampart, bordered with a parapet. They are deſigned to cover the faces and points of the baſtions.

COUNTER-LIGHT, or CONTRE-JOUR, a light oppoſite to any thing, which makes it appear to diſadvantage. A ſingle counter-light is ſufficient to take away all the beauty of a fine painting.

COUNTER-MARCH, in military affairs, a change of the face or wings of a battalion. The files

counter-

counter-march to bring thoſe which are in front to the rear; and the ranks counter-march, when the wings or flanks of a battalion change ground with each other.

Counter-marching alſo ſignifies returning or marching back again.

Counter-Mark, a mark put upon goods that have been marked before. It is alſo uſed for the ſeveral marks put upon goods belonging to ſeveral perſons, to ſhew that they muſt not be opened but in the preſence of them all or their agents.

Counter-Mine, a well or hole ſunk into the ground by the beſieged, with a gallery or alley running from it to diſcover the enemy's mines, and prevent their effect.

Counter-Mure, a wall built cloſe to another, that it may not receive any damage from the contiguous buildings.

Counter-Paled, *Contre-Pallé*, in heraldry, is when the eſcutcheon is divided into twelve pales parted per feſſe, the two colours being counter-changed; ſo that the upper are of one colour, and the lower of another.

Counter-Part, in muſic, denotes one part to be applied to another. Thus the baſs is ſaid to be a counter-part to the treble. In law, it is the duplicate or copy of any indenture or deed.

Counter-Passant is when two lions are in a coat of arms, and the one ſeems to go quite the contrary way from the other.

Counter-Plea, in law, a croſs or contrary plea, particularly ſuch as the demandant alledges againſt a tenant in courteſy or dower, who prays the king's aid, &c. for his defence.

Counter-Point, in muſic, the art of compoſing harmony, or of diſpoſing ſeveral parts in ſuch a manner as to make an agreeable whole or a concert. In general, every harmonious compoſition, or compoſition of many parts, is called counter-point. It took its name from hence: before notes of different meaſures were invented, the manner of compoſing was to ſet pricks or points one againſt another, to denote the ſeveral concords.

Counter-Pointed, *Contre-Pointé*, in heraldry, is when two chevrons in one eſcutcheon meet in the points, the one riſing as uſual from the baſe, and the other inverted falling from the chief; ſo that they are counter to one another in the points. They may alſo be counter-pointed when they are founded upon the ſides of the ſhield, and the points meet that way, called counterpointed in feſſe.

Counterpoise, in the manege, is the liberty of the action and ſeat of a horſeman; ſo that in all the motions made by the horſe, he does not incline his body more to one ſide than to the other, but continues in the middle of the ſaddle, being equally on his ſtirrups, in order to give the horſe the proper and ſeaſonable aids.

Counterpoise is alſo a piece of metal called by ſome the pear, on account of its figure, and the maſs, by reaſon of its weight, which ſliding along the beam, determines the weight of bodies weighed by the ſtatera Romana. See the article Balance.

Counter-Poison, an antidote or medicine which prevents the effects of poiſon. See the article Poison.

Counter-Potent, *Contre-Potencé*, in heraldry, is reckoned a fur as well as vair and ermine, but compoſed of ſuch pieces as repreſent the tops of crutches, called in French, *potences*, and in old Engliſh, *potents*.

Counter-Proof, in rolling-preſs printing, a print taken off from another freſh printed; which, by being paſſed through the preſs, gives the figure of the former, but inverted. To counter-prove is alſo to paſs a deſign in black lead, or red chalk, through the preſs, after having moiſtened with a ſponge both that and the paper on which the counter-proof is to be taken.

Counter-Quartered, *Contre-ecartelé*, in heraldry, denotes the eſcutcheon, after being quartered, to have each quarter again divided into two.

Counter-Rolls, are the rolls that ſheriffs of counties have with the coroners of their proceedings, as well of appeals as of inqueſts.

Counter-Round, a body of officers going to inſpect the rounds.

Counter-Salient is when two beaſts are borne in a coat leaping from each other directly the contrary way.

Counter-Scarp, in fortification, the ſlope of the moat which faces the body of the place: but this word is frequently uſed for the glacis, and covered-way.

Angle of the Counter-Scarp, is that made by the two ſides of the counter-ſcarp meeting before the middle of the curtain.

Counter-Signing, the ſigning, the writing of a ſuperior in quality of ſecretary. Thus charters are ſigned by the king, and counterſigned by a ſecretary of ſtate or lord chancellor.

Counter-Swallow-Tail, in fortification, an out-work in form of a ſingle tenaille, wider at the gorge than the head.

Counter-Tally, one of the two tallies upon which any thing is ſcored.

Counter-Tenor, called by the French, *haut-contre*, one of the middle parts of muſic oppoſite to the tenor. See the article Tenor.

Counter-Time, in the manege, is the defence or reſiſtance of a horſe that interrupts his cadence, and the meaſure of his manege, occaſioned either by a bad horſeman, or by the malice of the horſe.

Counter-Trench, in fortification, certain trenches thrown up by the garriſon againſt the beſiegers.

COUNTER-TRIPPING, is when two beaſts are borne in a coat in a walking poſture, the head of the one being next the tail of the other.

COUNTER-WORKING, the raiſing of works to oppoſe thoſe of the enemy.

COUNTER is alſo the name of a counting-board in a ſhop, and of a piece of metal with a ſtamp on it, uſed in playing at cards.

COUNTER *of a Horſe*, that part of a horſe's fore-hand which lies between the ſhoulders and under the neck.

COUNTRY, among geographers, is uſed indifferently to denote either a kingdom, province, or leſſer diſtrict. But its moſt frequent uſe is in contradiſtinction to town: thus it is ſaid, that ſuch a man went down into the country.

Among miners, the term countries is an appellation given to the works under ground. See the article MINE.

COUNTY, in geography, originally ſignified the territory of a count or earl; but now it is uſed in the ſame ſenſe with ſhire.

COUNTY-CORPORATE, a title given to ſeveral cities on which the Engliſh monarchs have thought proper to beſtow extraordinary privileges, annexing to them a particular territory of land, or juriſdiction, as the county of Middleſex annexed to the city of London, the county of the city of York, &c.

COUNTY-COURT, a court of juſtice, held every month in each county, by the ſheriff or his deputy.

This court has the determination of debts and treſpaſſes under forty ſhillings.

COUPED, *Coupé*, in heraldry, is uſed to expreſs the head, or any limb, of an animal, cut off from the trunk, ſmooth; diſtinguiſhing it from that which is called erazed, that is, forcibly torn off, and therefore is ragged and uneven.

COUPED is alſo uſed to ſignify ſuch croſſes, bars, bends, chevrons, &c. as do not touch the ſides of the eſcutcheon, but are, as it were, cut off from them.

COUPLET, a diviſion of a hymn, ode, ſong, &c. wherein an equal number, or equal meaſure, of verſes is found in each part, which diviſion, in odes, are called ſtrophes. See the article STROPHE.

Couplet, by an abuſe of the word, is frequently made to ſignify a couple of verſes.

COURANT, or CURRANT, in a general ſenſe, expreſſes the preſent time, as we ſay, the year 1765 is the currant year; the firſt of this currant month, that is, this preſent year and month.

COURANT, in a commercial ſenſe, any thing that has a courſe, or is received in commerce; as the courant coin, &c. alſo the ordinary and known price of goods, &c. in which ſenſe we ſay, the price courant.

COURIER, a meſſenger ſent poſt, or expreſs, to carry diſpatches.

COURSE, or way of a ſhip, in navigation, is the point of the compaſs on which the ſhip moves; or rather, the angle which the courſe or track of the ſhip makes with the meridian. Now the neareſt way between any two places on the globe will be the arc of a great circle, and therefore, were this method of ſailing, commonly called great circle ſailing, as eaſy and convenient in the calculation as the others are, it would certainly be the beſt; but ſince the arc of a great circle makes a different angle with every meridian it paſſes over, that is, the angle of the ſhip's courſe is continually varying, there can be no conſtant practical rule for her conduct deduced from this method. This difficulty, not only in this, but in every other method of navigation formerly known, made it neceſſary to look out for ſome method by which the ſhip's courſe could be regulated in ſuch a manner as at all times to make equal angles with the meridian, and this was happily effected in the invention of the compaſs: for by the property of magnetiſm, the needle will in every place make a given angle with the meridian, if the ſhip be ſteered on a given point of the compaſs, and therefore the ſhip muſt croſs every meridian under equal angles while the needle remains in the ſame poſition with reſpect to the meridian, and as the needle cannot change its poſition, without being obſerved by the navigator, he may at all times, when he finds that to be the caſe, eaſily regulate the courſe of the ſhip, ſo as to bring the needle to its former poſition, or allow for the quantity of its variation, as the exigence of the caſe may require.

The line thus deſcribed by the ſhip, ſailing in the manner above-deſcribed, is called a RHUMB-LINE, for the particular properties of which ſee that article.

COURSE, in architecture, a continued range of ſtones, level, or of the ſame height throughout the whole length of the building, without being interrupted by any aperture.

COURSE *of Plinths*, the continuity of a plinth of ſtone, or plaiſter, in the face of a building, to mark the ſeparation of the ſtones.

COURSE is alſo applied for the time ſpent in learning the elements of a ſcience; as a ſtudent is ſaid to go through his courſes of philoſophy, divinity, mathematics, &c. at the univerſity.

COURT, *Curia*, in a law ſenſe, the place where judges diſtribute juſtice, or exerciſe juriſdiction: alſo the aſſembly of judges, jury, &c. in that place.

COURT-BARON, a court that every lord of a manor has within his own precincts.

COURT *of Chivalry*, or the *Marſhal's* COURT, that whereof the judges are the lord high conſtable, and the earl marſhal of England.

COURT

COURT *of Conſcience*, a court in the cities of London, Weſtminſter, and ſome other places, that determines matters in all caſes, where the debt or damage is under forty ſhillings.

COURT *of Delegates*, a court where delegates are appointed by the king's commiſſion, under the great ſeal, upon an appeal to him from the ſentence of an archbiſhop, &c. in eccleſiaſtical cauſes; or of the court of admiralty in any marine cauſe.

COURT-LEET, a court ordained for the puniſhment of offences under high-treaſon againſt the crown.

COURT-MARTIAL, a court appointed for the puniſhing offences in officers, ſoldiers, and ſailors, the powers of which is regulated by the mutiny bill.

COURT *of Requeſts*, was a court of equity, of the ſame nature with the chancery, but inferior to it. It was chiefly inſtituted for the relief of ſuch petitioners as in conſcionable caſes addreſſed themſelves to his majeſty: the lord privy-ſeal was chief judge of this court.

COURT is alſo an appendage to a houſe or habitation, conſiſting of a piece of ground, incloſed with walls, but open at top.

COURT is alſo uſed for the palace or place where a king or ſovereign prince reſides.

COURTESY, or CURTESY *of England*, a certain tenure, whereby a man marrying an heireſs ſeized of lands of fee ſimple, or fee tail general, or ſeized as heir of the tail ſpecial, and getteth a child by her that cometh alive into the world, though both it and his wife die forthwith; yet if ſhe were in poſſeſſion, he ſhall keep the land during his life, and is called *tenant per legem Angliæ*, or tenant by the curteſy of England; becauſe this privilege is not allowed in any country except Scotland, where it is called *curialitas Scotiæ*.

COUSIN, a term of relation between the children of brothers and ſiſters, who in the firſt generation are called couſin-germans, in the ſecond generation, ſecond couſins, &c. If ſprung from the relations of the father's ſide, they are denominated paternal couſins; if on the mother's, maternal.

COUSINET, in architecture, the ſtone that crowns a piedroit, or pier, the under ſide of which is level, and the upper curved to receive the firſt ſpring of an arch or vault. It is alſo the face on the ſide of the volutes in the Ionic capital, which the French artiſts call baluſtre and oriller.

COUSU, in heraldry, ſignifies a piece of another colour or metal placed on the ordinary, as if it were ſewed on, as the word imports. This is generally of colour upon colour, or metal upon metal, contrary to the general rule of heraldry.

COVERT, in heraldry, denotes ſomething like a piece of hanging, or a pavilion falling over the top of a chief or other ordinary, ſo as not to hide but only to be a covering to it.

COW, in zoology, the female of the ox kind. See the articles BOS and OX.

COW-ITCH, in botany, the Engliſh name of the hairy phaſeolus. See PHASEOLUS.

COW'S-LIP, *Primula Veris*, in botany. See the article PRIMULA.

COWARD, in heraldry, a term given to a lion borne in an eſcutcheon with his tail doubled, or turned in between his legs.

COWL, or COUL, a habit worn by the Bernardines and Benedictines, of which there are two kinds, one white, very large, worn in ceremonies; the other black, worn on ordinary occaſions in the ſtreets, &c.

COXENDIX, in anatomy, a general term for the hip. See the article HIP.

CRAB, in naval affairs, a ſort of wooden pillar let down through a ſhip's decks, having its lower end reſting in a ſocket called a ſawcer; and in the upper end two or three holes above one another through the middle of it, into which long bars are let, whoſe length are nearly equal to the breadth of the deck. It is uſed to heave in the cable, or purchaſe any other weighty matter which requires a great mechanical power. This machine differs from a capſtern, in having no drum-head, and in having the bars to go entirely through it, and reach from one ſide of the deck to the other; whereas thoſe of the capſtern are more in number, and only reach about eight inches or a foot into the drum-head, according to their different ſizes. See the article CAPSTERN.

CRAB'S CLAWS, *Chelæ Cancrorum*, in the materia medica, are the tips of the claws of the common crab, broken off at the verge of the black part, ſo much of the extremity of the claws only being allowed to be uſed in medicine as is tinged with this colour. The blackneſs however is only ſuperficial: they are of a greyiſh white within, and when levigated, furniſh a tolerably white powder.

Crab's claws are of the number of the alkaline abſorbents, but they are ſuperior to the generality of them in ſome degree, as they are found on a chemical analyſis to contain a volatile urinous ſalt. They are always kept in the ſhops levigated to a fine powder, and are ſometimes prefcribed ſingly, though rarely, becauſe of their want of the beautiful white colour of ſome of the others. They are the baſis, however, of the famous Gaſcoigne-powder, the lapis contrayerva, and many other of the compound ſudorific powders.

CRAB'S EYES, *Oculi Cancrorum*, in pharmacy, are a ſtrong concretion in the head of the cray-fiſh. They are rounded on one ſide, and depreſſed and ſinuated on the other, conſiderably heavy, moderately hard, and without ſmell. We have them from Holland, Muſcovy, Poland, Denmark, Swe-

den, and many other places, some of them probably taken out of the heads of the animals, but the far greateſt part picked up on the ſhores of the Baltic, and of other ſeas and large rivers.

Crab's eyes are much uſed both in the ſhop medicines and extemporaneous preſcriptions, being accounted not only abſorbent and drying, but alſo diſcuſſive and diuretic.

CRAB-TREE, in botany, a ſpecies of the malus or apple; the fruit is leſs than moſt apples, and is extremely acid and aſtringent: its chief uſe is for making verjuice.

CRADLE, a well known machine, in which infants are rocked to ſleep.

It denotes alſo that part of the ſtock of a croſs-bow where the bullet is put.

CRADLE, in ſurgery, a caſe in which a broken leg is laid after being ſet.

CRAMBE, wild ſea-cabbage, in botany, a genus of plants, the flower of which is tetrapetalous and cruciform: the fruit is a roundiſh capſule, with one cell and two valves, containing a ſingle roundiſh ſeed. This plant is uſed as an aliment like other cabbage, when very young, but is eſteemed more hot and dry. Dale tells us, the leaves heal wounds, and diſcuſs inflammations and other tumours.

CRAMP, in medicine, a convulſive contraction of a muſcular part of the body, being either natural, as in convulſive conſtitutions, or accidental, from living in cold places, under ground, &c. It affects all parts indifferently, but the hams, calves, feet, and toes, oftener than the arms and hands: it is ſeldom mortal, though its returns are often, quick, and continuance long, with great pain and diſtenſion of ſome veſſels, as appears from the knots and ganglions it occaſions. If it be natural, obſerve the cure as in an epilepſy or convulſions; if accidental, it is removed by rubbing the part affected.

CRAMP-FISH, the Engliſh name of the torpedo. See the article TORPEDO.

CRAMP-IRON, or CRAMPS, a piece of iron bent at each end, which ſerves to faſten together pieces of wood, ſtones, or other things.

CRAMPONEE, in heraldry, an epithet given to a croſs, which has at each end a cramp or ſquare piece coming from it; that from the arm in chief towards the ſiniſter angle, that from the arm on that ſide downwards, that from the arm in baſe towards the dexter ſide, and that from the dexter arm upwards.

CRANE, in mechanics, is a machine of vaſt uſe in raiſing great weights, ſuch as large ſtones, merchandiſe, timber, &c.

The crane is of two kinds, chiefly; the firſt of theſe, repreſented in Plate XXXIX. *fig.* 1. is fixed, except its gibbet B G V, which is moveable on its axis B G, in order to convey the burthen over the carriage, or whatever elſe is deſigned to receive it. The ſecond, generally called the rat's-tail crane, in which the whole crane, with its burthen, &c. turns round on the ſtrong poſt S. *fig.* 2. But thoſe are again conſtructed in different manners, according as their different ſituations or uſes require; and often, according to the different degrees of ſkill or experience in the conſtructors. We ſhall give a brief deſcription of both thoſe forms, together with their ſeveral inconveniencies, improvements, additions or alterations, as far as hath come to our knowledge.

When great weights are to be raiſed from a conſiderable depth, and laid on carriages very near the precipice, as for inſtance at the edge of a ſtone quarry, it muſt be a fixed one, and only the gibbet moveable. Thus let A C B E L D *fig.* 1. repreſent a crane of this kind, A *a* Q the roof of the crane, to preſerve the rope R T *r r* paſſing over the gibbet B C V from the weather, when the arm of the gibbet is brought under it, by being turned towards Y; A T the upper piece of the crane, called the plate, in an horizontal poſition, X Y Z the three crane poſts, braced at top and bottom, D S, M N, I E three cills within the ſtone-work, braced with wood, and made faſt with an upright plate of iron pinned to the wood on each ſide. When the crane is not in ſtone-work, the three pieces, or cills, muſt be one continued piece, reaching from D to E, H I and *b* E are the braces of the main poſt of the crane, which come up above the level of the wharf L *w* B, and which are longer and ſtronger than the others. Here a croſs piece, whoſe ſection is (&) keeps the main poſt from twiſting; R O is the capſtern, or ſhaft of the crane on which the rope or chain is wound, and turned by the handſpikes *b d*, *f d*, and *e d*, the part being ſtrengthened with iron hoops above and below the hole at *d*; it turns on an iron pivot at O, in a hole, in a piece whoſe ſection is F: *p p* are two pins which hold on a collar in which the upper part of the ſhaft turns; C T P Q, a ſtrong piece or block, having three pullies, one vertical and two horizontal ones, the rope turning over the firſt, and between the other two.

In this conſtruction there are ſeveral inconveniencies; the firſt is that when the weight is raiſed to the height required, the uſual method of moving the arm of the gibbet toward W or *w*, is by means of a rope faſtened thereto, called the guide rope, which a man is to pull in order to bring the weight over the place where it is to be lowered. Now, in performing of this, the main rope or chain, not continuing parallel to the arm of the gibber, gives the weight a tendency towards that ſide to which it deviates; and ſometimes ſo ſuddenly, that without care, and much force applied, if the weight be very great, the burthen will ſwing to or from the carriage, ſo as to break every thing in its way. To remedy this ſome fix an horizontal piece like

Fig. 1. Crane.

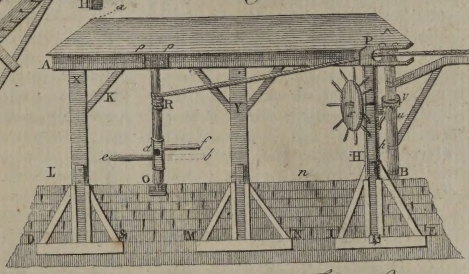


Fig. 2. Crane

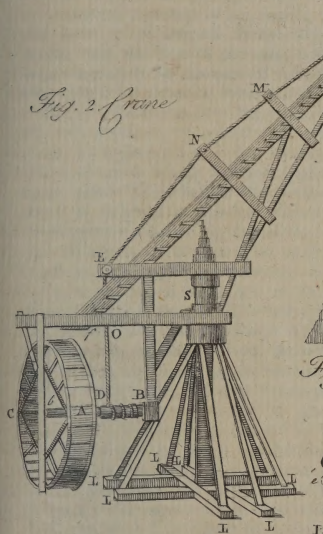


Fig. 4. Crane

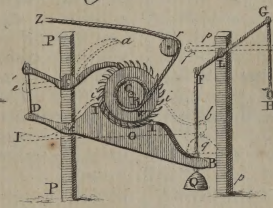


Fig. 3. Crane

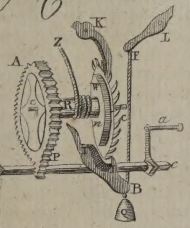


Fig. 5. Crepusculum

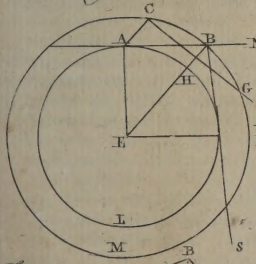


Fig. 6. Crepusculum

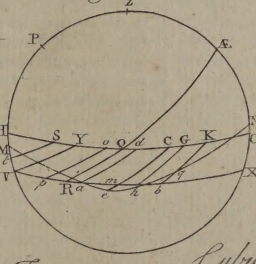


Fig. 7. Crepusculum

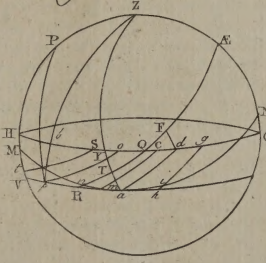
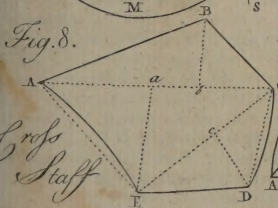
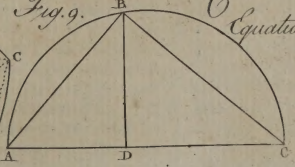


Fig. 8.



Cross Staff

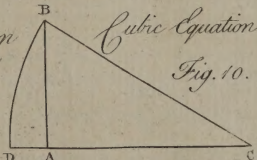
Fig. 9.



Cubic Equation

Cubic Equation

Fig. 10.



T. Lodge Sculp.

a hand-spike in the upright shaft of the gibbet, a little above B, to turn it by, but in this case also, the force is so unequal as the weight is carried round, that the lives of the men, who are loading, depends entirely on the care of the man who guides the weight by either of those methods.

But if upon the axis of the gibbet there be fixed an iron wheel *y*, of several teeth, to be carried round by a pinion *u* of a few leaves, upon the end of whose axis, which passes through the perpendicular piece T X, behind the shaft of the gibbet there is fastened a wheel *x* with arms; a man standing at that wheel is out of the way, and has such an advantage of power as to hold the weight steady in any position whatsoever; its tendency to swing being not sensibly felt at the ends of the arms of the last wheel. The first who made use of this method was the late Ralph Allen, Esq; at his stone quarry at Bath, where the weight raised is four or five, and sometimes six or seven, ton.

The second sort, or that commonly called the rat's-tail crane, is represented by *fig.* 2. it moves round like a wind-mill on the post S, which is fixed standing upright by means of the braces and cills L L L L L L L L, F *f* is a brace and ladder serving for the same uses with the gibbet E N M F, pullies for the rope to run over and come to the weight at H, A C a wheel of a large diameter for two or three men to walk in, by which means the wheel is turned, and the rope R M N E D wound on the horizontal axis B *b*. But this is the very worst and most dangerous method of working a crane; instead of which the horizontal axis B *b* is now oftener carried round by a strong wheel and pinion P C A *fig.* 3. by means of the two winches *a* and *b*; at the other end of the axis is sometimes fixed a wheel with teeth, and a catch K, to hold the burthen to the height it is brought up to, while the crane is turned round in order to lower the burthen into the vessels, which is done by lifting up the catch, and being ready to let it down as need may require: but this, not to mention the sudden jerk this method must give to the whole machine, and thereby, when the weight is very considerable, run the risk of tearing it all to pieces; it is liable to be forgot through carelessness, or for want of presence of mind, when any great danger is apprehended.

Another method of stopping this crane is by means of a smooth wheel of wood, as W *n* instead of the toothed one, against which a semi-circumference of wood D I I B is held hard by means of the lever G F moving on the center L, and the ropes H G and F B while the weight is descending; but as in this case likewise, if the man at the crane be careless, very bad accidents may happen, Mr. Padmore made such a contrivance that the pall or lever, by which the axle is pressed to regulate the descending motion, communicates with the catch above-mentioned in such manner, that if the man who ought to manage it, should carelessly let it go, the catch always takes, and by that means all accidents are prevented. This invention is as follows:

P P and *p p fig.* 4. represent two upright pieces fixed, in the most convenient manner, to the frame of the crane, so as to carry the three centers L K and *k*; when the main rope or chain R *r* Z, going over the pully at *r*, or any where else, draws from the axle in the direction R *r*, the catch, if the end is at A, keeps it immoveable; but by pulling at H, the lever G F rises at F, and consequently draws up the end B of the pall B D, which moving on the center *k*, does by its end D, by means of the bar D E, pull down E, and raise the end A of the catch, so as to let the weight run down; but to prevent its running too fast, one must pull a little harder, which it is evident from the figure, will cause the semi-circumference I O I to press against the wheel, and thereby slacken the descent of the weight, and if it is pulled very hard will entirely stop it. Now if the person holding at H, should, through, carelessness or otherwise, let it go, the weight Q in descending, will bring down the pall at B, and raise its other end, so as to throw the catch upon the teeth of the racket, and thereby stop the whole motion without accident.

But after all, where weights are to be raised or lowered a great way, as in loading or unloading vessels into, or out of high warehouses, and where the weight exceeds not two or three tons, and many hands not to be had, let a worm, or endless screw, turned by a handle at each end, be applied to the teeth of the wheel C A (*fig.* 3.) instead of the pinion P, but whose axis is placed at right angles to the axis of the pinion. This will be found to answer all the other contrivances, and be vastly more simple and commodious: for the teeth of the wheel are pulled by the weight so directly against the thread of the screw, that one may leave it in any position whatsoever, without any catch or danger of the weight running down.

But then if you would have the weight to descend pretty quick, which cannot be performed by applying the hand to the winch, it moving through a large space in comparison to the weight, and without which, sufficient force will be wanting, only give the winch a swing, and if the worm be well oiled, the two handles will perform the office of the fly of a jack, turning round very fast, and at the same time regulating the motion of the weight; and if at any time you want to stop it intirely, it will be sufficient to grasp the axis of the screw in the hand, which may by this means be stopped in two or three turns of the winch.

CRANE's BILL, among surgeons, a kind of forceps, so called from its figure.

CRANE's BILL, in botany, the English name for the geranium. See the article GERANIUM.

CRANIO-

CRANIOLARIA, in botany, a genus of plants whose flower consists of one unequal petal, and contains four stamina. The pericarpium is coriaceous, ovated, acute on both sides, and bivalvular.

The fruit is a woody depressed nut, acuminated on both sides, and marked with dentated furrows.

CRANK, a contrivance in machines, in manner of an elbow, only of a square form, projecting from a spindle, and serving by its rotation to raise and fall the pistons of engines.

CRANK likewise denotes the iron support for a lanthorn, or the like: also the iron made fast to a stock of a bell for ringing it.

CRANNY, in glass-making, an iron instrument, wherewith the necks of glasses are formed.

CRAPE, in commerce, a kind of stuff, made in the manner of gauze, with raw silk, gummed and twisted in the mill.

CRASIS, among physicians, is used to signify such a due mixture of qualities in a human body, as constitutes a state of health.

CRASIS, in grammar, the contraction of two letters into one long one, or a diphthong. Thus αληθεα is contracted into αληθη.

CRASSAMENTUM, in physic, the thick red, or fibrous part of the blood, otherwise called cruor, in contradistinction to the serum, or aqueous part. See BLOOD.

CRASSULLA, in botany, a genus of plants, whose flower consists of five narrow petals, with long, linear, straight, connivent ungues; and five subulated stamina.

The fruit is composed of five oblong, acuminated, straight, compressed capsules, opening longitudinally inwards, and filled with a number of small seeds.

CRATÆGUS, wild-service, in botany, a genus of plants, the flower of which consists of five roundish concave petals, inserted into the cup with many stamina.

The fruit is a roundish, fleshy, umbilicated berry, containing two hard oblong seeds.

The common wild-service grows to the size of a pear-tree, and the trunk is covered with a whitish smooth bark, but the young branches are covered with a brownish red. The leaves are placed alternately, and stand on pretty long foot-stalks; these are cut into many acute angles, with several small indentures on their edges; the flowers are white, and produced in large bunches towards the extremities of the branches; the fruit is like those of the hawthorn, of a brownish colour, and if kept some time has a tartish agreeable flavour.

They are reckoned good in all kinds of fluxes.

The wood is hard and white, and is useful for many purposes; but particularly to mill-wrights.

CRATCHES, in the manege, a swelling on the pastern, under the fetlock, and sometimes under the hoof; for which reason it is distinguished into the sinew cratches, which affect the sinew, and those upon the cronet, called quitter-bones.

CRATICULA, a kind of grid-iron, or chemical instrument, made of square pieces of iron, of the thickness of one's finger, placed in acute angles, about half a finger's space distant from one another. It serves in making fires to keep up the coals.

CRAY, a distemper in hawks, proceeding from long feeding upon cold stale meat.

CRAY-FISH, the English name of the larger long-tailed squillæ. See SQUILLA.

CRAYON, or PASTIL, among painters, implies a composition of colours, reduced to the texture of chalk; and used dry, in the form and manner of pencils, for painting on paper.

CREAM, the fat part of the milk that swims upon the surface. See MILK.

CREAM *of Tartar*, called also crystals of tartar, in pharmacy, a preparation of tartar made in the following manner:

Take any quantity of crude tartar, boil it in water, till the parts which are capable of solution be entirely dissolved; filter the liquor whilst hot thro' a flannel bag into an earthen pan, and evaporate till a pellicle appears, then set it in a cold place, and suffer it to stand quietly two or three days: afterwards decant the fluid, and the crystals will be found adhering to the pan: scrape them off, and evaporate the fluid as before, and set it again to crystallise, and repeat the operation till the crystals are formed. Cream of tartar is a gentle purge. It attenuates and resolves tough humours, and is good against obstructions of the viscera, and in cachectic complaints. It is also a good adjunct to chalybeate medicines.

CREAT, in the manege, an usher to a riding-master; or, a gentleman bred in the academy, with intent to make himself capable of teaching the art of riding the great horse.

CREATION, the producing something out of nothing, which strictly and properly is the effect of the power of God alone, all other creations being only transformations, or change of shape. Creation, say the schoolmen, from no pre-existing subject, may be understood in different senses. 1. That is said to be created out of no pre-existing matter, in the production of which no matter is employed; as an angel. 2. Although matter may be employed in the production of a thing, it may be so produced as that both its matter and form are caused by the same agent at the same time. In this manner were the heaven and the earth created, in the opinion of those who deny that God made the chaos. 3. Although matter may be the subject in producing a thing, yet that thing may not depend on matter either with respect to its future or present existence. Such is the human soul, for although it is created

in pre-existing matter, it is not created out of pre-existing matter, but of nothing, and therefore is no ways dependent on matter for existence. See the article WORLD.

Epocha of the CREATION. See the article EPOCHA.

CREATION, in the Romish church, the re-production of the humanity of Jesus Christ in the eucharist, by the words of the consecration.

CREDENTIALS, letters of recommendation, and power, especially such as are given to ambassadors, or public ministers, by the prince or state that sends them to foreign courts.

CREDIBILITY, a species or kind of evidence, less indeed than absolute certainty or demonstration, but greater than mere possibility: it is nearly allied to probability, and seems to be a mean between possibility and demonstration. See the article EVIDENCE.

CREDIT, in commerce, a mutual trust or loan of merchandize, or money, on the reputation of the probity and sufficiency of a dealer.

CREDITOR, a person to whom any sum of money is due, either by obligation, promise, or otherwise.

CREDITOR, in book-keeping. See the article BOOK-KEEPING.

CREED, a brief summary of the articles of a Christian's belief.

CREEK, the part of a haven where any thing is landed from the sea.

CREEPER, in ornithology, a name given to several species of ispida, otherwise called certhia, or certhius, and in English, the ox-eye.

CREEPER, in naval affairs, a small instrument of iron, having a shank and four hooks or claws, and something resembling a grappling. It is used to throw into the bottom of any river or harbour, with a rope fastened to it, to hook and draw up any thing from the bottom. See GRAPPLING.

CREMASTER, in anatomy, the name of a muscle of the testicle, of which there is one on each side.

It arises fleshy from the lowest and fore-part of the os ilium, and upper part of the ligamentum pubis: its fibres running parallel with those of the oblique ascendens, and almost encompassing the process of the peritonæum, descends with it, and is inserted into the tunica vaginalis, upon which it spreads in several distinct portions.

CRENATED, among botanists, is said of leaves, the edges of which are furnished with indentings, contiguous to each other, and neither inclining toward the point nor base. Of these some are acute, others obtuse, &c.

CRENELLE, or IMBATTLED, in heraldry, is used when any honourable ordinary is drawn, like the battlements on a wall to defend men from the enemies shot.

CREPIS, in botany, a genus of plants, whose flower is compound, uniform, and imbricated; the proper flowers are monopetalous, ligulated, and indented at the top in five parts, each containing five short hairy filaments, topped with cylindraceous antheræ. The seed is oblong, solitary, and crowned with long feathery down.

CREPUSCULUM, in astronomy, the same with twilight; by which is understood the time from the first appearance of the morning until sun-rise, and from sun-setting until there be no remains of day.

The crepuscule, or twilight, is chiefly caused by the atmosphere surrounding the earth, which reflects back the light of the sun upon us so strongly, as totally to obscure the faint light of the stars, and thereby render them invisible: for were there no atmosphere involving the earth, no part of the heavens would appear to shine, but that in which the sun is placed; and a spectator, if he turned his back to the sun, would immediately perceive it as dark as night, and in the day-time, when the sun was shining in its utmost splendour, the least stars would be seen shining, as they do now in the night in every part of the heavens but that wherein the sun then was.

Moreover, if there were no atmosphere, the sun immediately before his setting, would shine as briskly as at noon; but in a moment, as soon as he is set, we should have the face of the earth in as great darkness as it would be at midnight: so quick a change, and so sudden a passing from the greatest light to the greatest darkness, would be very inconvenient to the inhabitants of the earth. But by means of the atmosphere it happens, that though after sun-setting we receive no direct light from the sun, yet we enjoy its reflected light for some time; so that the darkness of the night comes not suddenly, but by degrees. For after the earth by its revolution round its axis has withdrawn us from the sight of the sun; the atmosphere, which is higher than we are, will still be illuminated by the sun; so that for a while the whole heavens will have some of his light imparted to it. But as the sun goes still lower under the horizon, the less is the air illuminated by him: so that when he is got as far as 18 degrees below the horizon, he no longer enlightens our atmosphere, and then all that part thereof that is over us becomes dark.

So likewise in the morning, as soon as the sun comes within 18 degrees of the horizon, he begins again to enlighten the atmosphere, and to diffuse his light through the heavens: so that its brightness does still increase, till the sun rises and makes full day.

To make this plainer, imagine the circle A D L (Plate XXXIX. *fig.* 5.) on the surface of the earth, in the plane of the vertical circle in which the sun is when under the horizon. Let there likewise be

another concentral circle C B M in the same plane, including that portion of the air that reflects the sun's beams: and suppose the eye to be on the earth's surface at A, whose sensible horizon is A N. Since no line can be drawn to A between the tangent A N and the periphery A D, by the sixteenth of the Third book of Euclid's Elements, it is plain, that when the sun is under the horizon, no direct rays can come to the eye at A: but the sun being in the line C G, a line may be drawn from him to C, so that the particle C may be illuminated by the direct rays of the sun; which particles may reflect those rays to A, where they may enter the eye of the spectator: and by this means the beams of the sun's light illuminating an innumerable multitude of particles, may by them be reflected to the spectator in A. Let the tangent A B meet with the surface of the orb of air that reflects the light in B; and from B draw B D, touching the circle A D L in D, and let the sun be in the line B D at S: then the ray S B will be reflected into B A, and will enter the eye, because of the angle of incidence D B E being equal to the angle of reflection A B E: and that will be the first ray that reacheth the eye in the morning, and then the dawning begins; or the last which falls upon the eye at night, when the twilight ends. For when the sun goes lower down, the particles at B can be no longer illuminated.

The reflection of the atmosphere does not seem to be the only cause of the twilight; but there is an ætherial air or atmosphere likewise round the sun, which shines after the body of the sun is set: this orb of the sun's atmosphere rising sooner, and setting later than the sun itself, shines out at mornings and nights in a circular figure, it being a segment of the sun's atmosphere cut by the horizon; and its light is quite of another sort than that which is made by the reflection of our atmosphere. But the duration of the twilight that arises from the sun's atmosphere, is shorter much than that made by the reflection of the earth's atmosphere, which does not end till the sun comes to be 18 degrees below the horizon, or thereabouts. But there can be no certain bounds fixed for the beginnings and endings of the twilights; for their lengths depend on the quantity of matter in the air which is able to reflect light, and on the height of the atmosphere. In the winter the air being condensed by the cold is low; and on that account the twilights are sooner over. In the summer the air is rarified by heat, and therefore being higher remains longer illuminated by the sun, so that the twilights last the longer: also the duration of the twilight is shorter in the morning than at night. We generally reckon that the twilight begins or ends, when in the morning the stars of the sixth magnitude disappear, or in the evening when they first come to be seen; the light of the air before that rendering them invisible. Ricciolus observed at Bonania, that the morning twilight about the time of equinocties, lasted an hour and forty-seven minutes; but in the evening two hours, and did not end till the sun was twenty degrees under the horizon: but in summer, the morning twilight was three hours and forty minutes long; the evening twilight scarcely ended till midnight.

Hence if we have the time of the beginning of the twilight in the morning, or the end of it at night, we may find the height of the air that reflects the light; for then the twilight ends, when a ray of light from the sun touches the globe of the earth, and is by the highest air reflected to our eyes: for having the time, we can find the depression of the sun below the horizon, and from thence the height of the air. For let S B be a ray of light touching the earth, which is reflected by a particle of air in its highest region, in the horizontal line A B; the angle S B N is the measure of the depression of the sun below the horizon: and because A B is also a tangent, the angle A E D at the center is equal to the angle S B N; and its half, that is, the angle A E B, is equal to half S B N or half the depression of the sun. Suppose the depression of the sun at the beginning or end of twilight be eighteen degrees; then the angle A E B will be nine degrees, which would be true, did the ray S B pass through the atmosphere without refraction: but because it is refracted and bent towards H, we must diminish the angle A E B by a quantity equal to the horizontal refraction, which is about half a degree: and therefore the true measure of the angle A E B is $8\frac{1}{2}$ degrees. Moreover, A E is to B H as the radius is to the excess of the secant of the angle A E B above the radius, that is, as 100000 is to 1110. Therefore if the semidiameter of the earth be in round numbers 4000 miles, B H the height of the atmosphere which reflects the sun's rays, will be about 44 miles; for as 100000 is to 1110, so is 4000 to 44.

In a right position of the sphere the twilights are quickly over; because the sun descends constantly nearly in a perpendicular; but in an oblique sphere they last longer, the sun descending obliquely; and the more oblique the sphere is, that is, the greater the latitude of the place is, so much longer last the twilights: so that all they who are in above forty-eight degrees latitude in the summer, near the solstices, have their atmosphere illuminated the whole night, and the twilight lasts till the sunrising, without any compleat darkness.

In a parallel sphere the twilight lasts for several months; so that the inhabitants have either the direct or reflect light of the sun for almost all the year.

If below the horizon you conceive a circle to be drawn parallel to the horizon, and at a distance from it equal to the depression of the sun at the end of the twilight: this lesser circle is called the circle

circle which terminates the twilights; for whenever the ſun by its apparent diurnal motion reaches this parallel, the morning twilight begins, or the evening ends, in whatever parallel of the equator the ſun is.

In Plate XXXIX. *fig.* 6. let H Q O be the horizon, V *a* X the circle parallel to it terminating the twilight, the circle H Z O the meridian, Æ Q *a* the equator. It is manifeſt that the more oblique the equator is to the horizon, ſo much the greater are the arches of the equator and its parallels, intercepted between the horizon and the terminating circle V *a* X. The arches Q R, *d a*, C *e*, G *h*, K *l*, are called the arches of the twilights, becauſe they determine the duration: and as each arch has a bigger or leſs proportion to its circle, ſo will the twilight when the ſun is in that parallel, be longer or ſhorter. In the circle bounding the crepuſcles take any point *a*, through which paſſes a parallel to the equator *d a*; and though *a* imagine a great circle to be drawn as M *a* N, touching the circle of perpetual apparition: and ſince the horizon likewiſe touches the ſame circle, theſe two circles will make equal angles with the equator and its parallels; for the meaſure of each angle is the diſtance of the parallel from its great circle. So likewiſe all the arches of the equator, and its parallels between the horizon and the circle M *a* N are ſimilar, by Prop. 13. Book II. Theodoſius's Sphericks. This circle M *a* N (*fig.* 7.) will either cut the bounding circle V *a* X in two points, or touch it in one. Let it firſt cut it in two points *a* and *h*; and therefore the arches of the parallels *d a*, G *h* are ſimilar: wherefore when the ſun by its diurnal motion deſcribes theſe two parallels, the twilights are equal; but while he deſcribes any intermediate parallel as C *e*, the time of the twilight is ſhorter; for in this caſe C *m* the arch of twilight is leſs than C *e*, which is ſimilar to the arch *d a* or G *h*, and C *e* and *d a* are deſcribed by the ſun in equal times. But when the ſun is in parallels that are at a greater diſtance from the equator than G *h*, the twilights laſt longer; for the twilight arch *l* K is greater than *q* K, which deſcribed by the ſun in the ſame time as the arch of the crepuſcle G *h*.

While the ſun is in parallels that are towards the elevated pole, the twilights do conſtantly grow longer, according as thoſe parallels approach the poles: for the twilight arch *o p* is longer in being deſcribed Q R, and Y U the ſame way is longer than *o p*. But if the ſun deſcribe the parallel S *t*, it never will meet with the bounding circle, and then the twilight laſts the whole night long.

Hence ariſes a great difference between the increaſe of the twilight and its decreaſe, and the increaſe and decreaſe of days and nights. For while the ſun moves from the beginning of ♋ to the firſt of Capricorn, all that time the days conſtantly decreaſe, and the nights increaſe: but in the twilight it is otherwiſe; for though the twilight and days are at the longeſt when the ſun is in the firſt degree of ♋, and then they both decreaſe together; yet the times of twilight do not contiually decreaſe till the ſun comes to ♑, but there is a certain point between ♎ and ♑, to which when the ſun arrives, we have the ſhorteſt twilight. From thence the twilights will begin to increaſe again, and there will be one arch of twilight ſimilar to that when the ſun is in the equator, before he reaches ♑: and if the ſun ſhould go farther ſouth, even beyond the tropic, the twilights would ſtill increaſe, although the days decreaſed. And although the days from the beginning of the ſun's entry into ♑ do conſtantly increaſe, yet the twilights grow ſhorter till the ſun comes to a point between ♑ and ♈, in which again we have the ſhorteſt twilight: this appears plain by what we are here to demonſtrate in the next place.

2dly, Let the circle M *a* N (*fig.* 8.) touch the bounding circle in one point, which ſuppoſe to be *a*, through which draw the parallel to the equator *d a*; I ſay that when the ſun is in this parallel the twilight will be the ſhorteſt of all. For becauſe the arches of the parallels intercepted between the horizon and the circle M *a* N are all ſimilar, they will be deſcribed by the ſun in equal times: but becauſe the twilight arches *c e* and and *g h* are greater than *c m* or *g i*, the ſun will be longer in moving through the arch *c e* than *c m*, and through the arch *g h* than *g i*; that is longer than in deſcribing the arch *d a*, which arch therefore is the ſhorteſt twilight.

The diſtance of that parallel from the equator in which is the ſhorteſt twilight, is thus inveſtigated. Becauſe the circle M *a* N and the horizon H O touch the ſame parallel, which is the circle of perpetual apparition, they will both be equally inclined to the equator: and therefore the angle *a n* T of the equator, and the circle M *a* N, is equal to the angle F Q *d* of the equator and the horizon. Thro' the zenith Z and the point *a* draw the vertiele circle Z Y *a*, cutting the equator in the point T. The ſpherical triangles *a n* T, T Q Y, are mutually equiangular to each other, becauſe the angles at *a* and Y are right; and we have ſhewed that the angles at Q and *n* are equal; alſo the angles at T are equal, being vertical to each other: theſe triangles then being equiangular, are alſo equilateral; and therefore T *a* will lie equal to T Y, or to half the diſtance of the bounding circle from the horizon: moreover, *a n* is equal to Q *d*, by 13 Prop. book II. Theod. for F R and *d a* are parallel, and therefore *d* Q is equal to Q Y.

In the ſpherical triangle T Q Y rectangular at Y, we have the ſide T Y half the diſtance of the bounding circle from the horizon; as alſo the angle Y Q T equal to F Q *d*, which meaſures the complement of the latitude of the place; wherefore we

we can find QY, and Q*d*, which is equal to it. From the point *d* to the equator draw the circle of declination *d*F; and inthe ſpherical triangle *d*QF, we have *d*Q and the angle Q, by which we can find the arch *d*F, the declination of the parallel of the leaſt twilight from the equator, which was to be found.

This problem might have been ſolved by one ſingle analogy. For in the triangle TQY, the radius: tang. TY:: co-tang. Q: ſin. QY, or to the ſin. of *d*Q: but the ſin. of Q: coſin. of Q:: rad.: co-tang. Q. Therefore by the rules of the fifth Element, the rad. multiplied by the ſin. of Q, will be to the tang. of TY into the coſin. of Q, as the radius is to the ſin. of Q*d*: but in the right-angled triangle Q*d*F, radius is to the ſine of Q*d* as the ſine of the angle Q to the ſine *d*F; wherefore rad. × ſine Q will be to the tang. of TY × co-ſine of Q, as the ſine of Q to ſine of *d*F; and thence, *ex æquo*, it will be as radius to tang. of TY, ſo co-ſine of Q, or the ſine of the latitude to the ſine of the diſtance of the parallel from the equator. Having the declination of the ſun, the time of the beginning of the morning twilight, which we call break of day, or the end of the evening twilight is thus to be found. Let *o p* be the parallel of the ſun meeting with the bounding circle in *p*; and draw through the pole the circle of declination P*p*. In the ſpherical triangle PZ*p* we have all the ſides for ZP is the complement of the latitude, P*p* the complement of the ſun's declination, and Z*p* equal to the ſum of a quadrant, and the diſtance of the bounding circle from the horizon = Z*l* + *lp*. From which we can find the angle ZP*p*, and its complement to two rights *p*PV: and the arch of the equator meaſuring this angle being converted into time, will ſhew the beginning or end of twilight.

CRESCENT, *Creſcens*, the new moon, which, as it begins to recede from the ſun, ſhews a little rim of light, terminating in points, called horns, that are ſtill increaſing, till it is in oppoſition to the ſun, at which time it is full moon, or quite round.

CRESCENT, in heraldry, a bearing in form of a new moon.

CRESCENT is alſo an order of knights, inſtituted by Renatus of Anjou, king of Sicily, about the year 1448, ſo called from the badge of this order, which was an enamelled creſcent of gold.

CRESCENT, a term among farriers. Thus a horſe is ſaid to have creſcents, when that part of the coffin bone which is moſt advanced falls down and preſſes the ſole outwards, and the middle of his hoof above ſhrinks, and becomes flat, by reaſon of the hollowneſs beneath it.

CRESCENTIA, in botany, the calabaſh-tree. This plant grows naturally in the Weſt-Indian iſlands: it riſes to the height of twenty or thirty feet, with ſeveral knots upon the ſtem, dividing at the top in many branches, which ſpread, and form a regular head. Theſe are furniſhed with leaves, which come out irregularly; and are about ſix inches long, oval, and acuminated; of a livid green colour, with very ſhort foot-ſtalks.

The flowers are produced from the ſides of the branches, ſtanding upon long foot-ſtalks. The calyx is ſhort, monophyllous, and deeply divided into two obtuſe ſegments. The corolla is monopetalous, and irregular, having a gibbous tube. The limb is reflexed, and divided into five ſegments: theſe are of a greeniſh yellow colour, ſtriped and ſpotted with brown. The ſtamina conſiſts of four ſlender filaments, two of which are the length of the corolla, and the other much ſhorter: theſe are terminated by double oblong antheræ.

The fruit is a large ſhell, either ſpherical, oval, or bottle-ſhaped, and incloſes a number of flat cordated ſeeds.

Theſe ſhells are large enough to contain three pints or two quarts of liquid; they are therefore made uſe of by the inhabitants of the iſlands for drinking-cups, after being cleaned of their pulp, the outer ſkin taken off, and dried: ſome of them are tipped with ſilver. They are alſo made uſe of for divers other purpoſes.

The leaves and branches of this tree are alſo eaten by the cattle in times when other provender are ſcarce, and the wood is hard and ſmooth, ſo is frequently uſed for making ſaddles, ſtools, and furniture.

Another ſpecies of creſcentia is found in Campeachy, which riſes not ſo high as the former, and the leaves, flowers, and fruit, are conſiderably leſs.

CRESS, or *Garden* CRESSES, in botany. See the article NASTURTIUM.

Indian CRESS. See TROPÆOLUM.

Sciatica CRESS. See IBERIS.

Water CRESS. See SISYMBRIUM.

Winter CRESS. See ERYSIMUM.

CREST, in armoury, the top part of the armour for the head, mounting over the helmet, in manner of a comb, or tuft of a cock, deriving its name from *criſta*, a cock's comb.

CREST, in heraldry, the uppermoſt part of an armoury, or that part of the caſk or helmet next to the mantle.

CREST, among carvers, an imagery, or carved work, to adorn the head, or top of any thing, like our modern corniche.

CREST-FALLEN, a fault of an horſe, when the upper part of his neck, called the creſt, hangs to one ſide: this they cure by placing it upright, clipping away the ſpare ſkin, and applying plaſters to keep it in a proper poſition.

CRETA, chalk, in natural hiſtory. See the article CHALK.

CREUX, a French term uſed among artiſts, and literally ſignifies a hollow cavity, or pit, out of which

ſome-

something has been scooped or dug: whence it is used to signify that kind of sculpture, where the lines and figures are cut and formed within the face or plan of the plate, or matter engraved; and thus it stands in opposition to relievo, where the lines and figures are embossed, and rise prominent above the face of the matter engraved on.

CRIB, a frame of wood, wherein moist things, particularly salt, as it is taken out of the boiling-pan, are put to drain.

CRIBRATION, in pharmacy, the passing any substance through a sieve, or searce, in order to separate the finer particles from the grosser, whether the body be dry and reduced to powder, or moist, as the pulps of seeds, fruits, or roots.

CRIBROSUM Os, in anatomy, called also os ethmoides, and os cribriforme, a bone situated internally in the fore-part of the basis of the skull. The uses of it are to be a principal part of the organ of smelling, and to give a very great extent to the pituitary membrane in a small compass.

CRIC, a machine, otherwise called a jack. See the article JACK.

CRICK, among farriers, is when a horse cannot turn his neck any manner of way, but holds it fore-right, insomuch that he cannot take his food from the ground without great pain. The cure is to thrust a sharp hot iron through the flesh of the neck in several places, at three inches distance, and rowel all of them with horse hair, flax, or hemp, anointing the rowels with hog's grease.

CRICKET, in zoology, the English name of the gryllus. See GRYLLUS.

Mole-CRICKET, the same with the gryllotalpa. See the article GRYLLOTALPA.

CRICOARYTANOIDÆUS, in anatomy, a name given to two muscles of the larynx, called the cricoarytænoides posticum, and the lateral cricoarytænoides. They serve to dilate the glottis.

CRICOIDES, in anatomy, a cartilage of the larynx, called also the annular cartilage. It occupies the lowest part by way of base to the rest of the cartilages; and to the lower part of it the aspera arteria adheres.

CRICOTHYROIDÆUS, in anatomy, one of the five proper muscles of the larynx, which arise and terminate in it. It serves occasionally either to dilate, or constringe the glottis.

CRINGLE, in naval affairs, a small hole made in the bolt-rope of a sail, by intertwisting one of the divisions of a rope called a strand, alternately round itself, and then through the bolt-rope till it becomes three-fold: the use of a cringle is to fasten the ropes to, which gather up a sail to the yard, when it is to be reefed or furled. See BRAIL, FURL, and REEF.

CRIME, *Crimen*, the transgression of a law, either natural or divine, civil or ecclesiastic.

CRIMNOIDES, or CRIMOIDES, among physicians, a term sometimes used for the sediment of urine, resembling bran.

CRIMSON, one of the seven red colours of the dyers. See the article COLOUR.

CRINONES, among physicians, small worms that breed in the skin, called also dracunculi. See the article DRACUNCULI.

CRINUM, lilly-asphodel, in botany, a genus of plants, the flower of which is infundibuliform and monopetalous: it contains six subulated filaments, topped with oblong, linear, incumbent antheræ. The fruit is a subovated capsule, with three cells, each containing one or two oval seeds.

CRISIS, in medicine, is used in different senses, both by the ancient and modern physicians. With some it means frequently no more than the excretion of any noxious substance from the body. Others take the word for a secretion of the noxious humours made in a fever. Others use it for the critical motion itself; and Galen defines a crisis in fevers, a sudden and instantaneous change, either for the better or the worse, productive of recovery or death. The doctrine of crises is very obscure; however, the following are reckoned the principal symptoms of an approaching crisis, a sudden stupor, drowsiness, waking, delirium, anxiety, dyspnœa, grief, redness, titillation, nausea, heat, thirst, &c. after digestion, and about the critical time; and the symptoms and effects of a present crisis are after the preceding ones, and vomiting, looseness, thick sediment in the urine, bleeding at the nose, hæmorrhoids, sweat, abscesses, pustules, tumours, buboes, &c.

CRISP LEAF, among botanists, is when the circumference of the leaf grows larger than the disk will admit of, so that the surface is undulated, or raised in waves.

It is likewise called a curled leaf.

CRISTA GALLI, in anatomy, a process of the os ethmoides, making the upper-part of the septum narium. It takes its name from the supposed resemblance to the comb of a cock.

CRITHE, in surgery, commonly called the style, is a tubercle that grows in different parts of the eye-lids. When it is small it comes only on the edge of the eye-lids, or very near it, between the cilia; but when it is large it spreads towards the middle of the lid. The cure of this disease must be varied, according as the crithe is attended with an inflammation, or is hardened and concreted.

CRITHMUM, samphire, in botany, a plant which grows on the rocks of the sea-side in many parts of England. The root is composed of many strong fibres, which strike deep in the crevices of the rocks. The stalks, which are fleshy and succulent, rise about two feet high, and are furnished with winged leaves.

The flowers are produced in circular umbels at the top of the stalks. These are of a yellow co-

four; and are compoſed of five ovated, inflexed petals, with five ſtamina, which are ſucceeded by two elliptical compreſſed ſeeds, ſtriated on one ſide.

Samphire is recommended in medicine againſt obſtructions of the viſcera and urinary paſſages; but is more uſed as a pickle: it is very agreeable to the palate, creates an appetite, and is comfortable to the ſtomach.

Another ſpecies of crithmum grows naturally on the Pyrenean mountains, which is claſſed by Tournefort among the parſleys.

CRITICAL DAYS and SYMPTOMS, among phyſicians, are certain days and ſymptoms in the courſe of acute diſeaſes, which indicate the patient's ſtate, and determine him either to recover or grow worſe. A careful obſervation of theſe days is of the greateſt uſe towards the cure of diſeaſes, leſt miſchief be done by unſeaſonable aſſiſtance from art, as when a phyſician endeavours to expel that which is not prepared to be evacuated, or elſe hinder the evacuation of ſuch humours, as being ſubdued and concocted, endeavour to eſcape by ſome convenient outlet. According as the violence of the diſeaſe is more ſwift or ſlow, the critical days will be more or leſs diſtant from each other: thus in fevers which do not exceed the ſpace of three weeks, the quaternary or ſeptenary days are critical; and beſides theſe, there are in the two firſt weeks many more incidentally critical days, as the third, fifth, ſixth, &c. but if an acute diſeaſe extends itſelf beyond three weeks, then the quaternary days no more take place as critical, but only the ſeptennary days are ſo, though the efficacy of theſe laſt is likewiſe aboliſhed after the fortieth day. See the article CRISIS.

CRITICISM, the art of judging with propriety concerning any diſcourſe or writing. Though the uſe of the word is ordinarily reſtrained to literary criticiſm, we may diſtinguiſh divers other branches of this art; as 1. Philoſophical criticiſm, the art of judging of the hypotheſes and opinions of philoſophers. 2. Theological criticiſm, the art of judging of explications of doctrines of faith. 3. Political criticiſm, the art of judging of the means of governing, acquiring, and preſerving ſtates. 4. Grammatical criticiſm, the art of interpreting the words of an author, &c. Lord Bacon divides criticiſm, 1. As it regards the exact correcting and publiſhing of approved authors, by which the honour of ſuch authors is preſerved, and the neceſſary aſſiſtance afforded to the reader; yet the miſapplied labours and induſtry of ſome have in this reſpect proved highly prejudicial to learning; for many critics have a way, when they fall upon any thing they do not underſtand, of immediately ſuppoſing a fault in the copy; and hence it happens that the moſt corrected copies are often the leaſt corrected. 2. As it reſpects the explanation and illuſtration of authors by notes, comments, collections, &c. But here an ill cuſtom has prevailed, of ſkipping over the obſcure paſſages, and expatiating upon ſuch as are ſufficiently clear; as if the deſign was not ſo much to illuſtrate the author, as to take all occaſions of ſhewing their own learning and reading. It were therefore to be wiſhed, ſays the noble author, that every original writer who treats an obſcure ſubject, would add his own explanation to his work, and thus prevent any wrong interpretation by the notes of others. 3. There belongs to criticiſm a certain conciſe judgment or cenſure of authors publiſhed, and a compariſon of them with other writers who have treated the ſame ſubject: in ſhort, the art of criticiſm, though reckoned by ſome as a diſtinct part of philoſophy, is in truth nothing elſe than a more correct and accurate knowledge in the other parts of it; and a readineſs to apply that knowledge upon all occaſions, in order to judge well of what relates to theſe ſubjects, to explain what is obſcure in authors, to ſupply what is defective, and amend what is erroneous in manuſcripts or ancient copies, to correct the miſtakes of authors and editors in the ſenſe of the words, to reconcile the controverſies of the learned, and by theſe means to ſpread a juſter knowledge of the beautiful paſſages and ſolid reaſoning of authors, among the inquiſitive part of mankind.

CRIZZELING is ſaid of glaſs, which, by reaſon of too great a proportion of nitre, tartar, or borax, is ſcabrous or rough on the ſurface.

CROCHES, among hunters, the little buds growing about the tops of a deer or hart's horns.

CROCI, among botaniſts, the ſame with antheræ. See ANTHERÆ.

CROCODILE, *Crocodilus*, in zoology, a ſpecies of lizard, with a two-edged tail and triangular feet, the fore ones having five, and the hinder only four toes.

This animal is the largeſt of the lizard kind, growing to twenty-five feet in length, and about the thickneſs of a man's body. It is a native of the torrid zone, frequently found in ſalt-water rivers, where it lies concealed among the reeds or ruſhes, till it finds an opportunity to ſeize men or other animals, which it drags into the water, always taking this method of drowning them firſt, that it may afterwards devour them without reſiſtance: its general food, however, is fiſh. The Africans and Indians eat its fleſh, which is white, and of a kind of perfumed flavour.

CROCUS, ſaffron, in botany, a genus of plants whoſe characters are, it hath a perennial bulbous root, with narrow gramineous leaves, which are annual.

The flower ariſes immediately from the root, and conſiſts of one petal; the tube of which is long, and the border is cut into ſix oblong, erect, equal ſegments: it hath three ſubulated filaments, ſhorter than the corolla, which are terminated with arrow-

arrow-shaped antheræ. The germen is placed at the bottom of the tube, and supports a filiform style, crowned with three convoluted, serrated stigmas.

The fruit is a roundish trilocular capsule, opening with three valves, and containing a number of roundish seeds.

There are many varieties of crocus, some of which blows early in the spring, and others in autumn; but it is from the autumnal crocus that well-known drug called saffron is taken.

The flower is of a beautiful purplish blue colour.

This species is cultivated in divers places; but is no where raised with so much success as in England. The usual way of propagating it is by the bulbs, of which it annually produces new ones. They are planted out in July in trenches, at three or four inches distance each way, and about the same depth. The off-sets produce only leaves the first year; but in September or October, the year following, they flower. As soon as the flowers open they are gathered, and the upper-part of the pistil or style is carefully separated from the rest, and reserved: This being the saffron, the other parts of the flower is thrown away as useless; the saffron is afterwards dried on a kiln built for the purpose, pressed into cakes, and is then fit for use.

Saffron is somewhat moderately heavy, very easily cut, of an acrid, penetrating, diffusive smell, somewhat affecting the head; but not unpleasant. The taste of it is hot, bitterish, and highly cordial: thrown into water, it almost instantaneously gives a strong, yellow, or reddish colour, according to the quantity used.

Saffron should be chosen fresh, tough, flexile, of a strong smell, and of a high fiery colour; the same within side the cake as without.

It is in many places in great esteem in sauces, and on many occasions in foods; but its great use is in medicine, and indeed with us its sole use. It is a high cordial, and a very powerful aperient, detergent, and resolvent. It is almost of immediate relief against faintings and palpitations of the heart: it also strengthens the stomach, and assists digestion. It is of great use in disorders of the breast, arising from the lungs being loaded with a tough phlegm; and it softens the irritating acrimony of a vitiated serum on those parts, and by this means is often of great use against inveterate coughs. It opens obstructions of the viscera, and particularly in the liver. It cures jaundices, and promotes the menses. It is also anodyne; and occasionally serves as a paregoric.

The dose is commonly from two or three grains to ten or twelve; but we are told of much greater quantities given by many people; however, the use of it ought to be moderate and seasonable; for when the dose is too large, it produces a heaviness of the head, and a sleepiness; and some have fallen into an immoderate, convulsive laughter, which ended with death.

CROCUS, in chemistry, denotes any metal calcined to a red or deep yellow colour: thus we meet with crocus martis aperiens and astringens, or the aperient and astringent crocuses of iron; also with the crocus veneris, or copper calcined to such a reddish powder.

CROCUS METALLORUM, an emetic preparation of antimony and nitre, thus made: Take an equal quantity of each, powder them separately, then mixing them well together, throw the mixture by degrees into a red-hot crucible, where it is to remain till melted thoroughly; this, after being separated from the scoriæ, is to be kept for use. By boiling this crude crocus, first reduced to a fine powder, in water, and afterwards washing it with more hot water, till it comes off insipid, is obtained the washed crocus of antimony.

CROE, or CROME, an iron bar with a flat end: also a notch in the side-boards of a cask, where the head-pieces come in.

CROFT, a little close adjoining a dwelling house, and enclosed for pasture or arable land, or any other particular use.

CROISADE, CRUSADE, or CRUZADO, a name given to the expeditions of the Christians against the infidels, for the conquest of Palestine; so called because those who engaged in the undertaking wore a cross on their cloaths, and bore one on their standard.

CROISIERS, *Crucigeri*, cross bearers, a religious order founded in honour of the invention or discovery of the cross, by the empress Helena.

CROISSANTE, in heraldry, is said of a cross, the ends of which are fashioned like a crescent or half moon. See CROSS.

CROSETTES, in architecture, the returns in the corners of chambranles, or door cases, or window frames, called also ears, elbows, aniones, &c.

CROSIER, or CROZIER, a shepherd's crook; a symbol or pastoral authority, consisting of a gold or silver staff, crooked at the top, carried occasionally before bishops and abbots, and held in the hand when they give the solemn benedictions. The custom of bearing a pastoral staff before bishops is very ancient. Regular abbots are allowed to officiate with a mitre and crosier. Among the Greeks none but a patriarch had a right to the crosier.

CROSIER, in astronomy, four stars in the southern hemisphere, forming a cross. These stars have too great southern latitude to be ever observed at the Royal Observatory; and therefore come not properly in our catalogue: notwithstanding, as they are said to be of great use to navigators in southern latitudes, we shall give their right ascension and declinations, as they have been settled from observations made by the late Abbé de la Caille; whose

authority, we believe, need not in this caſe be queſtioned. They are reduced to the ſame time with the other ſtars in this dictionary, viz. 1770.

Order.	Magn.	Name.	Bayer Let.	Right Aſcenſion.	Declination South.	Var. in Right Aſcen.	Var. in Declination.
				° ′ ″	° ′ ″	″	″
1	3		δ	180.46.05	57.28.11	46.5	20.04
2	1		α	183.30.00	61.49.28	48.3	20.01
3	2		γ	184.45.23	70.51.34	50.4	19.97
4	2		β	188.36.46	58.25.45	51.3	19.83

CROSLET, in heraldry, is when a croſs is croſſed again at a ſmall diſtance from each of the ends. Upton ſays it is not ſo often borne by itſelf in arms, as other croſſes are, but often in diminutives, that is, in ſmall croſlets ſcattered about the field.

CROSS, *Crux*, in antiquity, a ſpecies of puniſhment, or rather the inſtrument wherewith it was inflicted, conſiſting of two pieces of wood croſſing each other.

CROSS, in heraldry, is defined by Guillim, an ordinary compoſed of four-fold lines, whereof two are perpendicular, and the other two tranſverſe; for ſo we muſt conceive of them, though they are not drawn throughout, but meet, by couples, in four right angles, near about the feſſe-point of the eſcutcheon. The contents of a croſs is not always the ſame; for when it is not charged, it has only the fifth part of the field; but if it be charged, then it muſt contain the third part thereof.

CROSS-JACK, in naval affairs, a ſail extended on the lower-yard of the mizen-maſt, called hence the croſs-jack yard. This ſail, however, is very ſeldom uſed.

CROSS-PIECE, in naval affairs, a piece of wood extended over the windlaſs in merchant ſhips to faſten ropes to: the two ends of it are let into the knight-heads. See KNIGHT-HEADS.

CROSS-STAFF, the ſame with fore-ſtaff. See the article FORE-STAFF.

CROSS-STAFF, in ſurveying, an inſtrument, ſometimes made of braſs; but oftener of wood: when it is of braſs, it conſiſts of a circle, divided into four quadrants, by two lines interſecting each other at right angles in the center; and at the four points where thoſe interſect the circumference, are fixed four ſights, ſlit with a fine thread in each, in the ſame manner as in the theodilite, and under each ſlit, a ſmall ſight-hole. When it is made of wood it is nothing more than a perfect ſquare, with two ſlits, cut with a ſaw, in a diagonal manner, from corner to corner, which it is evident will interſect one another at right angles in the middle: and in both caſes it is mounted on a ſtaff. The uſe of this inſtrument is as follows:

Let ABCDE (Plate XXXIX. *fig.* 8.) be a field, or piece of land to be meaſured; when you go into it, look round and conſider in what manner it can be moſt commodiouſly divided into triangles; which ſuppoſe the triangles ABC, CDE, and ACE: with your chain begin and meaſure from A in a right-line towards C; but when you imagine you come near *a*, ſet up your croſs, and direct two of the ſights, or one ſlit (if your croſs be a wooden one) towards A and C, which being done, if through the other you can ſee E, then are you ſure you are in the point where the perpendicular E *a* will fall; but if you cannot, move it a little one way or other, as you find occaſion, until you can; which being done, meaſure from your ſtaff to E, the perpendicular *a* E, and then continue your meaſuring towards C; but when you come to *b*, you muſt obſerve the ſame directions, with regard to the perpendiculars B *b*, as was given for *a* E, and then meaſure on to C. This being done, will have the baſe AC, and two perpendiculars *a* E, and B *b* of the triangles ABC, and AEC; whence by the common rule for meaſuring triangles, their content will be eaſily found: and if the ſame be obſerved, with regard to the triangle CDE, and the three areas added together, it will give the area of the whole piece, if all the ſides be right-lines: but if they be curved or crooked, as the ſides AE or CD, it is evident this method can never give the true content; for if it be bent outwards, as CD, it will give the area of the triangle CDE too much by the ſpace, included between the ſide CD, and the ſtraight dotted line; and if it be bent inward, as AE, it will give the area too ſmall, by the ſpace included between that ſide and dotted line AE: and in either of theſe caſes, another method of ſurveying muſt be made uſe of by thoſe who would be accurate artiſts. See the article SURVEYING.

CROSS-TREES, certain pieces of timber laid acroſs the heads of the lower-maſts to make a frame for the top to reſt on. The uſe of the top is to extend the ſhrouds of the top-maſts, that they may ſupport it the better.

CROSSELET, a little or diminutive croſs, uſed in heraldry, where the ſhield is frequently ſeen covered with croſſelets; alſo feſſes and other honourable ordinaries, charged or accompanied with croſſelets. Croſſes frequently terminate in croſſelets.

CROTAPHITES, in anatomy, a muſcle of the lower jaw, ſerving to draw it upwards. Its fibres ſpring from the bones of the forehead, the ſinciput, ſphenoides, and temporale, which meeting, and as it were entering under the os jugale, whence alſo this muſcle receives ſome fibres, proceed to the proceſſus corone, into which they are inſerted.

CROTCHES, in naval architecture, certain crooked timbers in the after-hold, on which to form the

he narrower parts of a ſhip as ſhe approaches to the ſtern.

CROTCHES are alſo certain crooked pieces of wood or iron, fixed in different places of the ſhip to ſupport the ſpare-maſts, &c.

CROTCHET, in muſic, one of the notes or characters of time, marked thus 𝅘𝅥, equal to half a minim, and double of a quaver. See the articles CHARACTER, MINIM, and QUAVER.

A dot added to the crotchet, thus 𝅘𝅥., increaſes its time by one half, that is, makes it equal to a crotchet and a half.

CROTCHET, in printing, a ſort of ſtraight or curved line, always turned up at each extreme; ſerving to link ſuch articles as are to be read together; and uſed in analytical tables, &c. for facilitating the diviſions and ſubdiviſions of any ſubject.

CROTCHETS are alſo marks or characters, ſerving to incloſe a word or ſentence, which is diſtinguiſhed from the reſt, being generally in this form [ ] or this ( ).

CROTOLARIA, in botany, a genus of plants, whoſe flowers is papilionaceous; and contains ten ſtamina, joined together.

The fruit is a ſhort twigid legumen or pod, opening with two valves, and filled with reniform ſeeds.

CROTON, in botany, a genus of plants, producing male and female flowers. The male flowers of which being leſs than the female, conſiſt of five oblong, obtuſe petals, ſcarce larger than the cup, with ten or fifteen ſtamina. The petals of the female flower are the ſame as in the male.

The fruit is a roundiſh capſule, with cells, each cell having two valves, and contains in each a ſolitary, large, ovated ſeed.

This is the ricinoides of Tournefort.

CROUP *of a Horſe*, in the manege, the extremity of the reins above the hips.

CROUPADE, in the manege, a leap, in which the horſe pulls up his hind legs, as if he drew them up to his belly. Croupades differ from caprioles and balotades, in this, that in croupades the horſe does not jerk, as he does in the other two airs.

CROW, or CARRION-CROW, in ornithology, the Engliſh name of a ſpecies of corvus, about the ſize of the largeſt tame pigeon, and all over of a fine deep black colour, with large eyes and reflex briſtles at the noſtrils.

Royſton CROW, the Engliſh name of another ſpecies of corvus, with the body grey, the head, throat, wings, and tail, black.

CROW, in mechanics, a kind of iron lever with a claw at one end, and a ſharp point at the other; uſed for heaving or purchaſing great weights.

CROW'S BILL, among ſurgeons, a kind of forceps for drawing bullets and other foreign bodies out of wounds.

CROW'S FEET, in the military art, machines of iron, having four points, each about three or four inches long, ſo made that whatever way they fall, there is ſtill a point up: they are thrown upon breaches or in paſſes where the enemy's cavalry are to march, proving very troubleſome by running into the horſe's feet and laming them.

CROW-FOOT, in naval affairs, a certain complication of ropes that ſpread outward from a block to hang the awnings by, or keep the top-ſails from getting againſt the edges of the tops.

CROW-FOOT, in botany, the Engliſh name of the ranunculus. See RANUNCULUS.

CROW-STAVES, the two upright pieces inſerted into the box of a plough, and bored with a number of holes, by means of which they ſupport a tranſverſe piece, called the pillow of the plough. See the articles PLOUGH and PILLOW.

CROWN, an ornament worn on the head by kings, ſovereign princes, and noblemen, as a mark of their dignity.

The Roman emperors had four kinds of crowns, ſtill ſeen on medals, viz. a crown of laurel, a radial or radiating crown, a crown adorned with pearls and precious ſtones, and the fourth a kind of bonnet or cap, ſomething like the mortier.

CROWN, in commerce, a general name for coins both foreign and domeſtic, which are of, or very near, the value of five ſhillings ſterling.

CROWN, in architecture, denotes the uppermoſt member of the corniche, called alſo corona, and larmier. See the articles CORONA and LARMIER.

CROWN, in aſtronomy, a name given to two conſtellations, the one called borealis, the other meridionalis. See the article CORONA.

CROWN, in geometry, is a plane ring included between two concentric perimeters, and is generated by the motion of ſome part of a right line round a center, the ſaid moving part not being contiguous to the center.

The area of a crown will be had by multiplying its breadth by the length of the middle periphery; for a ſeries of terms in arithmetic progreſſion being $n \times \frac{a+w}{2}$, that is, the ſum of the firſt and laſt multiplied by half the number of terms, the middle element muſt be $\frac{a+w}{2}$; wherefore that multiplied by the breadth, or ſum of all the two terms, will give the crown.

CROWN *of Colours*, certain coloured rings which like halos appear about the body of the ſun or moon, but of the colours of the rain-bow, and at a leſs diſtance than the common halos. Theſe crowns Sir Iſaac Newton ſhews to be made by the ſun's ſhining in a fine day, or the moon in a clear night, through a thin cloud of globules of water or hail, all of the ſame bigneſs. And according as the glo-

bules are bigger or leſſer, the diameters of theſe crowns will be larger or ſmaller; and the more equal theſe globules are to one another, the more crowns of colours will appear, and the colours will be the more lively.

CROWN-GLASS denotes the fineſt ſort of window-glaſs. See the article GLASS.

CROWN-IMPERIAL, in botany. See the article FRITILLARIA.

CROWN-OFFICE, an office that belongs to the King's bench-court, of which the king's coroner or attorney is commonly maſter. In this office, the attorney-general and clerk of the crown ſeverally exhibit informations for crimes and miſdemeanors at common law, as in the caſe of batteries, conſpiracies, libelling, &c. on which the offender is liable to pay a fine to the king.

CROWN-POST, in architecture, a poſt which in ſome buildings ſtand upright in the middle between two principal rafters, and from it there go ſtruts or braces to the middle of each rafter. It is ſometimes called a king's piece, or joggle piece.

CROWN-WHEEL *of a Watch*, the upper wheel next the ballance, which by its motion drives the ballance, and in royal pendulums is called the ſwing-wheel.

CROWN-WORK, in fortification, an out-work having a very large gorge, generally the length of the curtin of the place, and two long ſides terminating towards the field in two demi-baſtions, each of which is joined by a particular curtin to a whole baſtion, which is the head of the work. The crown-work is intended to incloſe a riſing ground, or to cover the head of a trenchment.

CROWNING, in architecture, is underſtood of any thing that finiſhes a decoration. Thus a corniche, a pediment, a croteria, are called crownings.

CROWNING, in naval affairs, the finiſhing part of a knot made by the ends of the different ſtrands of a rope, being artfully intertwiſted amongſt each other to keep the end faſt in ſome place aſſigned for it.

CRUCIANELLA, in botany, a genus of plants, whoſe flower conſiſts of a ſingle petal: the tube is cylindrical, and the border is quadrifid and ſmall: it hath four ſtamina; and the fruit is two capſules, growing together, each containing an oblong ſeed. This is the rubeola of Tournefort.

CRUCIBLE, a chemical veſſel made of earth, and ſo tempered and baked as to endure the greateſt heat. They are uſed to melt metals, and to flux minerals, ores, &c.

The figure of a crucible is commonly that of an obtuſe conoid, with its baſe at the top, and obtuſe apex at the bottom; whence this conical figure may be varied, till it comes to the hollow ſegment of a ſphere. It is a rule that the lower and wider they are made, the more eaſily the volatile matter flies from the fixed, and that the fire is applied to more of the ſurface, both of the whole ſubject and its fixed part.

CRUCIFIX, a croſs upon which the body of Chriſt is faſtened in effigy, uſed by the Roman catholics to excite in their minds a ſtrong idea of our Saviour's paſſion.

CRUCIFORM, in general, ſomething diſpoſed croſs-wiſe; but more eſpecially uſed by botaniſts, for flowers conſiſting of four petals diſpoſed in the form of a croſs: ſuch are the flowers of cabbage, rocket, wall-flower, &c. See FLOWER.

From this ſtructure of the flower, Tournefort has denominated one of his claſſes of plants *cruciformes*; comprehending all plants with cruciform flowers, called by Linnæus tetradynamia.

CRUCIS EXPERIMENTUM. See the article EXPERIMENTUM CRUCIS.

CRUDE, an epithet given to ſomething that has not paſſed the fire, or had a proper degree of coction.

CRUDITY, among phyſicians, is applied to undigeſted ſubſtances in the ſtomach; to humours in the body which are unconcocted, and not prepared for expulſion; and to the excrements.

The crudity of the humours or morbific matter in a diſeaſe, is diſcovered chiefly from a fault in the quantity or quality of the circulating as well as the ſecreted humours, as of ſweat, mucus, ſaliva, urine, pus, blood, &c.

CRUOR, among anatomiſts, ſometimes ſignifies the blood in general; ſometimes only the venous blood; and ſometimes extravaſated, or coagulated blood.

CRUPPER, in the manege, the buttocks of a horſe, the rump; alſo a thong of leather put under a horſe's tail, and drawn by thongs to the buckle behind the ſaddle, ſo as to keep him from caſting the ſaddle forwards on his neck.

CRURA CLITORIDIS, in anatomy, two legs of the clitoris, which run from the oſſa pubis, and are three times as long as the clitoris in its natural ſtate. See the article CLITORIS.

CRURA MEDULLÆ OBLONGATÆ, the two largeſt legs or roots of the medulla oblongata, which proceed from the cerebrum.

CRURÆUS, or CRUREUS MUSCULUS, in anatomy, a fleſhy maſs, covering almoſt all the foreſide of the os femoris, between the two vaſti, which likewiſe cover the edges of this muſcle on each ſide. It is fixed to the foreſide of the os femoris, from the anterior ſurface of the great trochanter, down to the loweſt quarter of the bone, by fibres which run down ſucceſſively over each other, between the two vaſti, and are partly united to theſe two muſcles, ſo that they do not ſeem to form a diſtinct muſcle.

CRURAL, in anatomy, an epithet given to the artery

artery which conveys the blood to the crura, or legs, and to the vein by which this blood returns towards the heart.

CRUS, in anatomy, all that part of the body contained between the buttocks and the toes; it is divided into thigh, leg, and foot. See THIGH, LEG, and FOOT.

CRUSCA, an Italian term signifying bran, is in use amongst us to denote that celebrated academy called Della Crusca, established at Florence, for purifying and perfecting the Tuscan language.

CRUSTA VILLOSA, in anatomy, the fourth tunic, or coat, of the stomach. See the article STOMACH.

CRUSTA LACTEA, in medicine, the same with achor, being scabby eruptions with which the heads of children are often troubled. See the article ACHOR.

CRUSTACEOUS, an appellation given to animals covered with shells made up of several pieces, in contradistinction to those consisting of a single piece: the former are known, among authors, by the name of malacostraca; and the latter, by that of testaceous. See the articles MALACOSTRACA and TESTACEOUS.

CRUZADO, the same with croisade. See the article CROISADE.

CRUZADO, in commerce, a Portuguese coin; struck under Alphonsus V. about the year 1457, at the time when pope Calixtus sent thither the bull for the croisade against the infidels.

CRYMODES, among physicians, a kind of fever attended with a shivering cold and inflammation of the internal parts of the body. See the article FEVER.

CRYPTOGAMIA, κρυπτος, hid, and γαμος, marriage, a name given by Linnæus to the twenty-fourth class of plants in his system of botany. This class consists of such plants, whose organs of fructification is either concealed within the fruit itself, or so minute, as not to be perceptible to the naked eye. The fructification in these is also of an uncommon structure. To this class belong the ferns, mosses, flags, mushrooms, &c. See the articles FERN, MOSS, &c.

CRYTOGRAPHY, the art of writing in cypher, or with sympathetic ink. See the articles CYPHER and INK.

CRYSTAL, κρυσταλλος in natural history, the name of a very large class of fossils; hard, pellucid, and naturally colourless; of regularly angular figures, composed of simple, not filamentous plates; not flexible nor elastic, giving fire with steel; not fermenting in acid menstrua, and calcining in a strong fire.

CRYSTAL, is also used for a factitious body, cast in glass-houses, called crystal-glass; being, in fact, no more than glass carried, in the composition and manufacture, to a greater perfection than the common glass.

CRYSTALS, in chemistry, salts or other matters shot, or congealed, in manner of crystal.

CRYSTALS *of Silver, or Lunar Crystals*, are silver reduced into the form of salts, by the pointed acids of spirit of nitre. These crystals are like the solutions of an immediate caustic: they burn the skin on the slightest touch.

CRYSTALLI, among physicians, eruptions about the size of a lupin, white and transparent, which sometimes break out all over the body.

CRYSTALLINE, in general, something composed of, or resembling crystal. See the article CRYSTAL.

CRYSTALLINE HEAVENS, in ancient astronomy, two spheres, imagined between the primum mobile and the firmament, in the Ptolemaic system, which supposes the heavens solid, and only susceptible of a single motion. See the article PTOLEMAIC SYSTEM.

CRYSTALLINE HUMOUR, in anatomy, a thick, compact humour, in form of a flattish convex lens, situated in the middle of the eye, serving to make that refraction of the rays of light, necessary to make them meet in the retina, and form an image thereon, whereby vision may be performed. See EYE.

CRYSTALLIZATION, in chemistry, the reducing salts to their proper specific or crystalline form; so called from their resembling crystals.

CRYSTALLOIDES, the crystalline tunic of the eye; a fine membrane containing the crystalline humour.

CUB, a bear's whelp. Among hunters, a fox and a marten of the first year, are called cubs.

CUBATURE *of a Solid*, in geometry, the measuring the space contained in it; or finding the solid contents of it.

CUBE, in geometry, a solid, contained under six equal square sides. Its solidity is found by multiplying the length of one of its sides twice into itself: Thus, if the length of the side were four inches, &c. $4 \times 4 \times 4 = 64$, the solidity required.

CUBEBS, *Cubebæ*, dried berries, greatly resembling pepper, but furnished each with a slender stalk, whence they are called by some, *piper caudatum*. They are the fruit of an East-Indian tree, of which we have no particular account, said to resemble the apple-tree, and to produce its berries in clusters.

CUBIC *Numbers*, in arithmetic, are such as are formed by the multiplication of some one number twice into itself. Thus $4 \times 4 \times 4 = 64$ a cubic number; hence by comparing this with the foregoing article, it is easy to see the analogy there is between the geometrical solid, called a cube, and a cube number in arithmetic.

There are a great many remarkable properties in cubic

cubic numbers, which may be seen in moſt books of arithmetic and algebra, but which it is foreign to our province to take notice of here.

CUBIC *Quantities*, in algebra, wherein any quantity, as x is involved to the third power; that is, multiplied twice into itſelf, as was ſaid of numbers, and it is expreſſed by xxx, or x^3; this is called a ſimple cubic quantity: a compound one is formed of the continued multiplication of two ſimple quantities, connected with the ſigns + or —: as $x+y$ involved to the third power is $x^3+3x^2y+3xy^2+y^3$; that of $x-y$ is $x^3-3x^2y+3ay^2-y^3$. See *Multiplication of* ALGEBRA.

CUBIC *Equation*, in algebra, is an equation whoſe higheſt power is of three dimenſions, that is, has the unknown quantity involved to the power, as $x^3=a+b$, or $x^3+ax^2+bx=d$.

All cubic equations have three different roots either poſſible or impoſſible; but any one of them being once obtained, the reſt may eaſily be found.

Thus, for example: The equation $x^3-4x^2+7x-6=0$, has only one real root, which is 2, and two impoſſible ones: Now thoſe impoſſible ones may be eaſily found from having the real one given thus. Divide the equation $x^3-4x^2+7x-6=0$, by $x-2$, the quotient x^2-2x+3, muſt certainly be equal to nothing, ſince both the dividend and diviſor are ſo; whence we have $x^2-2x=-3$, and by compleating the ſquare and proper reduction, we get $x=1\pm\sqrt{-2}$ the two roots required, for either of thoſe being wrote in the equation for x, will make all its terms deſtroy one another, equally with the number 2, but then thoſe are called impoſſible roots, becauſe they require the extraction of the ſquare root out of the negative number 2. Again, if $x^3=a^3$ was given, we ſhould have, beſide $x=a$, the poſſible root; $x=a\times\frac{1}{2}\pm\sqrt{-\frac{3}{4}}$, two other values of x.

But it may not perhaps be amiſs to obſerve here, that it very often happens, more eſpecially in the ſolution of geometrical problems, that the roots of equations are poſſible, when the caſes to which they relate, may exhibit them impoſſible. As for example:

Let ABC, (Plate XXXIX. *fig.* 9.) be a circle whoſe diameter is AC, and let AB be any chord inſcribed in it; from B, the end of the chord, draw the line BD perpendicular to the diameter AC; and let it be required, having given the lines AB and AC, to compute AD, the ſegment of the diameter intercepted between the point A and D the foot of the perpendicular. Join BC, and call AD x: then will the ſimilar triangles ADB and ABC give the following proportion, to wit, AC is to AB as AB is to AD or x; whence $x=\frac{AB^2}{AC}$; therefore x, the root of this equation, will be equally poſſible, whether AB be greater or leſs than AC; but the problem will not be poſſible unleſs the chord AB be leſs than the diameter AC. Here then we have an inſtance of a problem's producing an equation whoſe root continues to be poſſible, even when the problem ceaſes to be ſo, on account of the limitation abovementioned, to wit, that the problem AB muſt be leſs than AC. To explain this myſtery, let AC and AB be any two given lines, and let it be required to aſſign a third proportional to them, which we call x: ſince then AC is to AB, as AB is to x, we have again $x=\frac{AB^2}{AC}$: but this problem is as unlimited as the equation it produces; for it is certain the two quantities AC and AB will admit a third proportional, whether AB be greater or leſs than AC. The caſe then ſtands thus: here is an equation ariſing from a limited problem; but this equation is alſo intended to ſolve another problem that is abſolutely unlimited; therefore it ought not to be expected that the equation ſhould be liable to any reſtriction, whatever may be the caſe of the problem that produced it.

The following method of ſolving cubic equations by means of the right-angled triangle ABC (Plate XXXIX. *fig.* 10.) as given by the late Mr. Cotes, we apprehend will be acceptable to our readers. He conſiders all cubic equations under this one general form, viz. $x^3\pm3a^2x=\pm2a^2b$; and the triangle right at A, as having always two ſides given, repreſenting the known quantities a and b in the equation.

Caſe I. If the equation be $x^3+3a^2x=\pm2a^2b$, make $AB=a$, $AC=b$; and let m and n be two mean proportionals between $BC+CA$ and $BC-CA$: then will $m-n$ be the only poſſible affirmative root, or $n-m$ the only poſſible negative root in the equation, according as the abſolute term is + or $-2a^2b$.

Caſe II. If the equation be $x^3-3a^2x=\pm a^2b$, and a be leſs than b; make $AB=a$ $BC=b$, and let m and n be the only poſſible affirmative root, and $-m-n$ the only poſſible negative one, accordingly as the abſolute term is + or $-2a^2b$.

Caſe III. If the equation be $x^3-3a^2x=\pm a^2b$, and a be greater than b, make $AB=b$, $BC=a$, and let m be the ſine of one-third part of the ſum of the two angles A and B, and n the ſine of a third part of their difference, in a circle whoſe radius is 2BC; then will the three roots of the equation be $m+n$, $-m$ and $-n$, or $+m$, $+n$, and $-m-n$, according as the abſolute term is + or $-2a^2b$.

The analogy of theſe three caſes, conſiſts in this; that whereas the two firſt caſes are reſolved by the ſum and difference of the ſides BC and CA, the laſt caſe is reſolved by the ſum and difference of their oppoſite angles A and B: and whereas the two firſt caſes were obtained by the triſection of a ratio,

in

in the laſt they are had by the triſection of an angle.

Thoſe who are curious to ſee a demonſtration of the preceding elegant method of ſolution, may have ample ſatisfaction, by conſulting Sanderſon's Algebra, page 719.

Cubic *Hyperbola*. See Hyperbola.

Cubic *Parabola*. See Parabola.

CUBIT, in the menſuration of the ancients, a long meaſure, equal to the length of a man's arm, from the elbow to the tip of the fingers.

Dr. Arbuthnot makes the Engliſh cubit equal to eighteen inches; the Roman cubit equal to 1 foot, 5,406 inches; and the cubit of the Scripture equal to 1 foot, 9,888 inches.

CUBITÆUS, in anatomy, the name of two muſcles; the one called cubitæus externus, being the firſt of the extenſor muſcles of the fingers, ariſes from the external extuberance of the humerus, and paſſing its tendon under the ligamentum annulare, is inſerted into the fourth bone of the metacarpus that ſuſtains the little finger: the other is the cubitæus internus, which ariſeth from the internal extuberance of the humerus, and the upper part of the ulna, upon which it runs all along, till it paſſes under the ligamentum annulare, and is inſerted, by a ſtrong and ſhort tendon, into the fourth of the firſt order of the carpus.

CUBITUS, in anatomy, a bone of the arm, reaching from the elbow to the wriſt, otherwiſe called the ulna. The cubitus, for the ſake of the more eaſy and varied motion, is compoſed of a binary number of bones, called the cubitus, or ulna, and the radius. The ſituation of the ulna is interior, its length is greater than that of the radius, and has a motion of flexion and extenſion.

CUBOIDES, or Os Cuboides, in anatomy, the ſeventh bone of the foot, ſo called from its reſembling a cube. It is ſituated in the external ſide of the tarſus, where it receives the outer bone of the metatarſus, and is articulated with the neighbouring bones.

CUCKOO, in ornithology, the Engliſh name of a well known bird, called by zoologiſts, cuculus. See Cuculus.

Cuckoo-Flower, in botany, a name ſometimes given a plant, more generally called cardamine, or lady's ſmock.

Cuckoo-Pint, in botany, the Engliſh name of the arum. See Arum.

Cuckoo-Spit, the ſame with froth-ſpit. See the article Froth-Spit.

CUCUBALUS, in botany, a genus of plants, whoſe flower conſiſts of five petals, the ungues of which are of the length of the cup. The filaments are awl-ſhaped, and ten in number, topped with oblong antheræ. The fruit is a cloſe acuminated capſule, opening at the top in five parts, and contains a number of roundiſh ſeeds.

CUCULLARIS, in anatomy, a muſcle of the ſcapula, otherwiſe called trapezius: it ariſes from the os occipitis, the ſpinoſe apophyſes of the neck, and of the ſeventh and eighth of the back. Its termination is at the ſpine of the ſcapula. It has the power of ſeveral very different motions; the different courſe of its ſeveral fibres enabling it, as they act differently, to move the ſcapula upwards, downwards, or backwards.

CUCULUS, the cuckoo, in ornithology, a genus of birds, of the order of the picæ, the characters of which are theſe: the beak is ſmooth; the noſtrils are a little prominent; the tongue is entire, and ſaggitated; the toes are four in number, two before and two behind.

The common cuckoo is a bird of conſiderable beauty, which breeds with us, but does not remain all the year.

Its head, neck, and back, are of a hoary colour, with ſome dark grey feathers; the wings are of a browniſh black, the throat of an undulated fleſh colour, and the belly whitiſh. The colour of the female differs but very little from that of the male.

CUCUMBER, *Cucumis*, in botany, a genus of plants which trail on the ground, on which the leaves are alternately diſpoſed, ſerrated on their edges, and rough to the touch; they are furniſhed with tendrils, and the flowers proceed from where the leaves join the ſtalk. There are male and female placed at diſtances on the ſame plant; both are camanulated and monopetalous, and cut into five ovated rough ſegments. The male flower hath three very ſhort filaments inſerted in the calyx, two of which have bifid tops; theſe are terminated by ſmall linear antheræ. The female flowers have no ſtamina, but are furniſhed with three ſmall acuminated filaments, with a ſhort, cylindraceous ſtyle. The fruit is oblong, trilocular, and fleſhy, and contains a number of oval, flat, pointed ſeeds.

There are ſeveral varieties of cucumbers, ſome of which are raiſed very early in the ſpring on hot-beds, and ſo very eager are many narrow-minded gardeners, to cut a cucumber a day or two ſooner than their neighbours, that they poſſeſs themſelves with a belief, that it is the ultimatum of gardening; and therefore give themſelves but little trouble with the other branches of their profeſſion, if they excel in this.

The art of raiſing cucumbers early depends upon the judgment, care, and practice of the perſon who undertakes it; for although many gardeners pretend to myſteries in this art, it depends wholly upon the following rules, viz. to throw up ſome new hot dung for a week or ten days, in order to foment and evaporate the ſtench; to make the bed where they are to grow even and true; and when the extreme heat is off, after the bed is earthed, (which ſhould not be too much at firſt, leſt it ſhould burn)

to put the plants out carefully; to give air to the plants at all opportunities; but this muſt be done with great caution, for if too much is let in, the plants will be deſtoyed, as they are extremely tender; and if they have too little, they are either drawn up weak, or elſe deſtroyed by the ſteam of the dung. It is impoſſible to give preciſe rules for this regulation, as it intirely depends upon the practice and judgment of the manager. As the plants continue to advance in growth, they ſhould have more earth added to them, and their extremities ſhortened, in order to put forth the ſooner lateral ſhoots, which produce the fruit, and from time to time they ſhould be kept thinned, otherwiſe they would grow in confuſion. When the heat of the bed is beginning to decline, ſome freſh dung ſhould be laid round the ſides, obſerving not to line higher than the bed; upon this barley ſtraw, coarſe hay, &c. may be continued up to the top of the box; when the bed is in good heat they may be watered, if the earth is dry, taking the opportunity of good weather. The glaſſes ſhould be covered at night in proportion to the heat of the bed and warmth of the weather, and at the time of blowing, to give as much air as poſſible, without detriment.

The young plants are raiſed from ſeeds under a glaſs on hot dung, and afterwards, either pricked out on a bed prepared, or in pots, and plunged in the ſame.

The firſt ſeaſon for ſowing cucumbers is at Chriſtmas, or the beginning of January, and the laſt is about the end of May. This is done in the natural ground, and their produce is made uſe of for pickling.

Cucumbers are very cooling and viſcid, and therefore apt to diſpoſe the blood to putrid fermentations. They do well therefore who dreſs them with a good quantity of vinegar and pepper; for as the former helps to keep up the due tenſity and contraction of the ſolids, the other preſerves the proper fluidity of the juices, and prevents them from running into morbid coheſions; they are likewiſe pretty well ſecured againſt the above-mentioned miſchiefs, by pickling with the like ingredients. The ſeeds are reckoned among the four greater cold ſeeds; theſe are cooling, and ſometimes emulſions of them have been preſcribed in burning fevers, a fit of the gravel, and heat of urine. To this genus Linnæus has added the melo, colocynthis, and anguria of Tournefort.

Wild CUCUMBER, in botany. See the article MOMORDICA.

CUCURBIT, in chemiſtry, an earthen or glaſs veſſel, ſo called from its reſemblance to a gourd, ariſing gradually from a wide bottom, and terminating in a narrow neck.

Blind CUCURBIT is a ſmall inverted cucurbit, adapted to another in ſuch a manner, that the neck of the one is inſerted in that of the other. The veſſel called circulatory is one of this kind.

CUCURBITA, in botany, the gourd or pompion, a genus of plants, whoſe flower is a campanulated petal, divided into five ſegments, ſome of which are male and others female. The fruit is large and fleſhy, and contains three membranaceous cells, incloſing a number of compreſſed, tumid, obtuſe ſeeds, placed in two rows. There are ſeveral ſpecies of cucurbita, ſome of which produce fruit of a monſtrous ſize, either round or long. They are raiſed from ſeeds, and cultivated here more for curioſity than uſe, though in America they uſe them as ſauce with their meat. An old dunghill is the beſt place to raiſe them upon, where they will ſpread to a great diſtance, and bear plenty of fruit.

CUCURBITULA denotes a cupping-glaſs. See the article CUPPING.

CUD, ſometimes means the inſide of the throat in beaſts, and ſometimes the food that they keep there, and chew over again: from whence, to chew the cud, ſignifies, to ponder, think, or ruminate upon a thing.

CUD LOST, implies cattle that ſometimes loſe their cud by chance, ſometimes by ſickneſs, poverty, mourning, &c. to cure which, take four leaven of rye bread, and ſalt, and mixing it with human urine and baum, beat it in a mortar; then making a large ball or two thereof, put them down the beaſt's throat.

CUD-WEED, in botany. See GNAPHALIUM.

CUE, among ſtage-players, an item, or innuendo, given to the actors on the ſtage, what, or when to ſpeak.

CUIRASSE, a piece of defenſive armour, made of plate, well hammered, ſerving to cover the body, from the neck to the girdle, both before and behind: whence

CUIRASSIERS, cavalry armed with cuiraſſes, as moſt of the Germans are: the French have a regiment of cuiraſſiers: but we have had none in the Engliſh army, ſince the Revolution.

CUL *de Lamp*, in architecture, a term uſed for ſeveral decorations, both of maſonry and joinery, found in vaults and ceilings, to finiſh the bottom of works, and wreathed ſomething in the manner of a teſtudo, particularly a kind of pendentive in Gothic vaults.

CUL *de Four*, a ſort of ſpherical vault, like an oven. See the article VAULT.

CUL *de Four of a Niche*, ſignifies the arched roof of a niche, on a circular plan.

CULDEES, in church hiſtory, a ſort of monkiſh prieſts, formerly inhabiting Scotland and Ireland. Being remarkable for the religious exerciſes of preaching and praying, they were called, by way of eminence, *Cultores Dei*; from whence is derived the word Culdees. They made choice of one of their

their own fraternity to be their ſpiritual head, who was afterwards called the Scotch biſhop.

CULLIAGE, a barbarous and immoral practice, whereby the lords of manors anciently aſſumed a right to the firſt night of their vaſſals brides.

CULM, among botaniſts, a term uſed to denote the ſtalk of graſſes, hence called culmiferous plants. See the next article.

CULMIFEROUS *Plants*, in botany, ſuch plants as have a ſmooth jointed ſtalk, uſually hollow, and at each joint wrapped about with ſingle, narrow, ſharp-pointed leaves, and their ſeeds contained in chaffy huſks, as wheat, barley, &c.

CULMINATION, in aſtronomy, is a term applied to any one of the heavenly bodies when it is on the meridian.

Line of CULMINATION, the ſame with meridian line.

CULPRIT, a formal reply of a proper officer in court, in behalf of the king, after a criminal has pleaded not guilty, affirming him to be guilty, without which the iſſue to be tried is not joined. After an indictment, for any criminal matter, is read in court, the priſoner at the bar is aſked whether he is guilty, or not guilty, of the indictment? If he anſwers, not guilty, there is a replication by the clerk of the arraignments from the crown, by continuing the charge of the guilt upon him, which is expreſſed in the word culprit.

The term culprit is a contraction of the Latin *culpabilis*, and the French *priſt*; importing that he is ready to prove the criminal guilty.

CULVERIN, in the military art, a large cannon, or piece of artillery, for the kinds, weight, and proportion of which, ſee the article CANNON.

CULVERTAILED, among ſhip-wrights, ſignifies the faſtening, or letting of one timber into another, ſo that they cannot ſlip out, as the carlings into the beams of a ſhip.

CUMMIN, *Cuminum*, in botany, an annual, umbelliferous plant, ſeldom riſing to a foot in height; the leaves are divided into long, narrow parts, like thoſe of fennel, but much leſs; the flowers grow in ſmall umbels on the top of the ſtalks; theſe are ſmall, roſaceous, and compoſed of five unequal petals, of a pale bluiſh colour, and are ſucceeded by longiſh, ſlender, plano-convex ſeeds, of a browniſh colour, with pale yellowiſh ſtriæ.

This plant is a native of Egypt and Ethiopia, and cultivated in the iſlands of Sicily and Malta, from whence we are ſupplied with the ſeeds.

The ſeeds of this plant is the only part uſed in medicine; they have a bitteriſh warm taſte, accompanied with an aromatic flavour, but not agreeable, with a very ſtrong ſmell; it is one of the four greater hot ſeeds, conſiſting of very warm diſſolving parts, and accounted carminative and ſtomachic. They are alſo uſed externally in cataplaſms and fomentations, wherever a warm diſcutient is required.

CUNEIFORM, in general, an appellation given to whatever reſembles a wedge.

The word is formed from the Latin *cuneus*, a wedge, and *forma*, reſemblance.

CUNEIFORM-BONE, in anatomy, the ſeventh bone of the cranium, called alſo os baſilare, and os ſphenoides. See the article SPHENOIDES-OS.

CUNEIFORM-BONES, or OSSA CUNEIFORMIA, are alſo three bones of the foot, all different in their ſizes, and articulated with the os naviculare, and with the three bones of the metatarſus, viz. thoſe which ſupport the great toe, the ſecond, and the third. See the articles METATARSUS and NAVICULARE.

CUNETTE, or CUVETTE, in fortification, a deep trench, about three or four fathoms wide, ſunk along the middle of a dry moat, to make the paſſage more difficult to the enemy.

CUNEUS, the wedge, in mechanics. See the article WEDGE.

CUNEUS, in antiquity, a company of infantry, drawn up in form of a wedge, the better to break through the enemy's ranks.

CUNILA, in botany, a genus of plants, whoſe flower is monopetalous and ringent; it contains two filiform filaments, topped with double antheræ, it has no pericarpium; the cup contains four minute oval ſeeds.

CUNNING, amongſt ſeamen, the art of directing the ſteerſman to guide the ſhip in her proper courſe: the officer who has this charge is either the pilot or quarter-maſter.

CUP, a veſſel of capacity of various forms and materials, chiefly uſed to drink out of.

CUP, among botaniſts, the ſame with calyx. See the article CALYX.

CUPOLA, in architecture, a ſpherical vault; or the round top of the dome of a church, in form of a cup inverted. See the article DOME.

CUPPEL, or *Coppel*, in chemiſtry. See the article COPPEL.

CUPPING, in ſurgery, the operation of applying cupping-glaſſes for the diſcharge of blood, and other humours, by the ſkin.

The operation of cupping is not confined to any particular member of the body; but wherever the cupping-glaſs is applied, it is fixed upon the ſkin, either intire or ſcarified, and hence we have a twofold diſtinction of cupping, into dry and gorey.

In dry cupping, the glaſs adheres to the ſkin, by expelling or rarefying its included air by lighted flax, or the flame of a burning candle within it, ſo that the glaſs is preſſed upon the part with a conſiderable force, by the external air. The uſe of this dry-cupping is two-fold, either to make a revulſion of the blood, from ſome particular parts affected, or elſe to cauſe a derivation of it into the affected part, upon

upon which the glaſs is applied: hence we have a reaſon why Hippocrates orders a cupping-glaſs to be applied under the breaſts of a woman who has too profuſe a diſcharge of her menſes, intending thereby to make a revulſion of the blood upwards from the uterus. Dry cupping is alſo uſed, with ſucceſs, to make a revulſion, by applying the glaſſes to the temples, behind the ears, or to the neck and ſhoulders, for the removal of pains, vertigoes, and other diſorders of the head: they are applied to the upper and lower limbs, to derive blood and ſpirits into them, when they are paralytic; and, laſtly, to remove the ſciatica, and other pains of the joints. The operation in theſe caſes is to be repeated upon the part, till it looks very red, and becomes painful.

In Germany, and other northern countries, cupping is much oftener joined with ſcarification, than uſed alone; in which caſe the part is firſt to be cupped, till it ſwells and looks red, and the ſkin is to be punctured, or inciſed, by the ſcarifying inſtrument.

As ſeveral glaſſes, ſometimes ſix or eight, are often applied at once, the operator muſt manage his buſineſs ſo, that ſome glaſſes may be filling while he is ſcarifying, and adapting the others. When the blood ceaſes to flow faſt enough, he muſt repeat his inciſions, cloſe by the former, and re-apply the cupping-glaſſes. The operation being finiſhed, and the ſkin well cleanſed with a ſponge, and warm water, it is next to be rubbed over with a bit of deer's ſuet, to promote the healing: but if the blood ſtill continues to flow, the ſkin is to be waſhed with ſpirit of wine and hungary water, binding it up with a compreſs and bandage.

The cupping-glaſs and inſtrument are repreſented in (Plate XL. *fig.* 1.)

This inſtrument conſiſts of a braſs box, on one of whoſe ſides are a number of lancets moveable by a ſpring within the box. When this ſide is applied to the ſkin, the ſpring is to be raiſed by the handle A; and on depreſſing the button B, it cauſes the lancets to pierce the ſkin all at once.

CUPRESSUS, the cypreſs-tree, in botany, a genus of coniferous trees.

The common cypreſs has a ſtraight thick trunk, paliſh, and ſometimes rediſh; and a very ſweet ſmell. It is ever-green; and the leaves are like thoſe of ſavin, the ſhoots being very ſmall, and ſeemingly covered with ſcales. The catkins of male flowers have very ſmall leaves or ſcales, which have each four antheræ adhering to their bottom; but are deſtitute of a corolla. The female flowers are formed in a roundiſh cone; and are apetalous. The germen is ſcarce viſible; but under each ſcale there are hollowed points in the place of ſtyles.

The fruit is a ſubgloboſe cone, opening with roundiſh and pointed ſquamas, under which is contained the ſeed, being an angular acuminated ſmall nut.

Theſe trees are all propagated by ſowing their ſeeds early in the ſpring on a bed of warm, dry, ſandy earth, covering with the ſame about half an inch thick. In about two months time the young plants will appear above ground, and ſhould be often watered: in two years time, they will be ſtrong enough for tranſplantation into a nurſery. The beſt ſeaſon is about the middle of April, in a cloudy day. They may remain here three or four years, when they may be planted where they are to remain for good.

Cypreſs-trees are ſo very ornamental to gardens, that no large garden can be complete without many of them; and it is to theſe trees that the Italian villas owe a great ſhare of their beauty: for there is no tree ſo proper to place near buildings; the pyramidal upright growth of their branches affords a pictureſque appearance, and obſtructs not the view of the building; and the dark green of their leaves make a fine contraſt with the white of the building; ſo that wherever there are temples, &c. erected in gardens, there is no ſort of tree ſo proper to place near them as theſe.

The timber of this tree is ſaid to reſiſt the worm, moth, and all putrefaction; and is ſaid to laſt many hundred years. The doors of St. Peter's church at Rome were framed of this material, which laſted from Conſtantine the Great, to pope Eugenius the Fourth's time, which was eleven hundred years, and were then ſound and entire, when the pope would needs change them for gates of braſs. The coffins were made of this timber, in which, Thucydides tells us, the Athenians uſed to bury their heroes; and the mummy-cheſts, brought with thoſe condited bodies out of Egypt, are many of them of this wood.

This tree is by many learned authors recommended for the improvement of the air, and a ſpecific for the lungs, as ſending forth great quantities of aromatic and balſamic ſcents; wherefore many of the ancient phyſicians of the eaſtern countries uſed to ſend their patients who were troubled with weak lungs, to the iſland of Candia, which at that time abounded with theſe trees, where, from the effects of the air alone, very few failed of a perfect cure.

CUPRUM, or COPPER, in natural hiſtory. See COPPER.

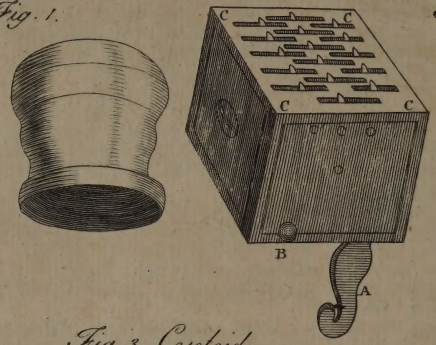
CURATE properly ſignifies the parſon, or vicar of a pariſh, who has the charge, or cure, of the pariſhioners ſouls.

CURATE alſo implies a perſon ſubſtituted by the incumbent to ſerve his cure in his ſtead.

CURB, in the manege, a chain of iron, made faſt to the upper-part of the branches of the bridle, in a hole, called the eye, and running over the horſe's beard. It conſiſts of theſe three parts, the hook fixed to the eye of the branch; the chain of S S's, or links; and the two rings or mailes.

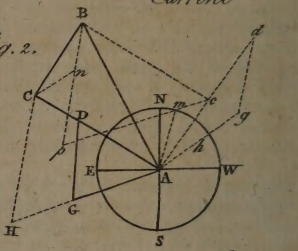
Cupping

Fig. 1.



Current

Fig. 2.



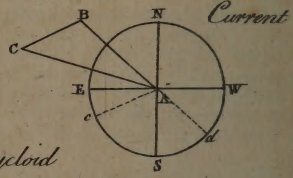
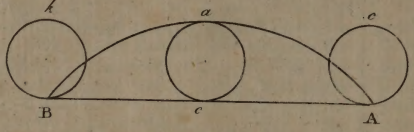


Fig. 3. Cycloid



Cycloid

Fig. 4.

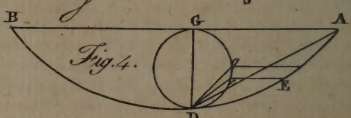


Fig. 5. Cycloid

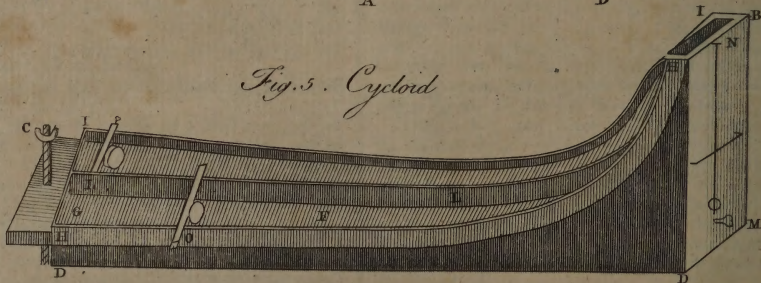
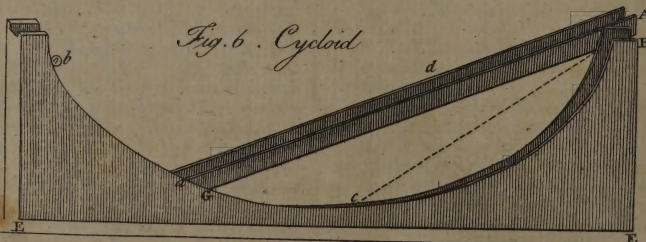


Fig. 6. Cycloid



CURB is also a hard and callous swelling, that runs along the inside of a horse's hoof, in the great sinew behind, above the top of the horn, which makes him halt, and go lame, when he has been heated. It is to be cured by the like applications as are prescribed in the spavin. See the article SPAVIN.

CURCUMA, turmeric, in botany. See the article TURMERIC.

CURDLING, the coagulating any fluid body, especially milk.

CURE *of Souls*, a benefice in the Christian church, the incumbent whereof has the direction of consciences within a parish.

CURETES, in antiquity, a sort of priests, called also Corybantes, being, as some relate, the same with what the Druids and Bards were afterwards among the Gauls.

CURFEW, or COURFEW, a signal given in cities taken in war, &c. to the inhabitants to go to bed. Pasquin says, it was so called, as being intended to advertise the people to secure themselves from the robberies and debaucheries of the night.

The most eminent curfew in England was that established by William the Conqueror, who appointed, under severe penalties, that, at the ringing of a bell, at eight o'clock in the evening, every one should put out their lights and fires, and go to bed: whence, to this day, a bell, rung about that time, is called a curfew-bell.

CURIA, in Roman antiquity, a certain division or portion of a tribe.

CURIO, in Roman antiquity, the chief and priest of each curia, or ward, whose business it was to officiate at the sacrifices of the curia, called curionia, and provide for them, the curia furnishing him with a sum of money on that consideration.

CURLEW, the English name of a bird, called by authors, arquata and numenius. See the article NUMENIUS.

CURNOCK, a measure of corn, containing four bushels, or half a quarter.

CURRAN, or CURRANT, *Ribes*, in botany, a shrub, whose bark is brown; but the extream shoots are ash-coloured. The leaves are like those of the vine, but much less; of a dark green above, but covered with a soft down beneath. The flowers grow in bunches, and are rosaceous: and the fruit is a well known globular berry.

The red, white, and black currant, with a few others, are easily propagated by cuttings: when the leaves fall in autumn, it is the best season for planting them. They grow in good land very freely, and in three or four years will produce fruit. Great quantities of the white and red currant-trees are raised within ten miles of London, for the supply of the markets, it being looked upon as good a crop as any in general, and but little expence attending them. They are commonly planted in rows, and in autumn the ground is dug up between them, and filled with coleworts: in the winter they should be pruned, observing to preserve the spurs which are on the old wood, and shortening the young shoots. A very little practice and observation will direct their management.

Red currants are reckoned more wholesome than the white; they are a very agreeable acid; and perhaps the most salubrious fruit that grows with us: they greatly assuage drought, cool and fortify the stomach, help digestion, excite an appetite, and are good against vomiting. But if eaten in too large quantities will cause looseness, attended with gripes, and are hurtful to the lungs.

Black currants have a very disagreeable, nauseous taste; however, a jelly is made of them, which is said to be a specific against the quinsey, if swallowed down leisurely in small quantities: it is also good to cure inflammatory distempers of the throat.

CURRANT, or COURANT-MONEY, that money which passes in commerce from one to another.

CURRENT, in hydrography, a stream or flux of water in any direction.

Currents, in the sea, are either natural and general, as arising from the diurnal rotation of the earth on its axis; or accidental and particular, caused by the waters being driven against promontories, or into gulphs and streights; where, wanting room to spread, they are driven back, and thus disturb the ordinary flux of the sea.

The currents are so violent under the equator, where the motion of the earth is the greatest, that they carry vessels very speedily from Africa to America; but absolutely prevent their return the same way; so that ships are forced to run as far as the 40th degree of latitude, to find a passage into Europe.

In the Streights of Gibraltar, the currents almost constantly drive to the eastward, and carry ships into the Mediterranean: they are usually, too, found to drive the same way into St. George's channel. The great violence and dangerousness of the sea in the Streights of Magellan, is attributed to two contrary currents setting in, one from the south, and the other from the north sea.

Dr. Halley makes it highly probable, that in the Downs, in the Streights of Gibraltar, &c. there are under currents, whereby as much water is carried out, as is brought in by the upper currents. This he argues from the ebbing between the North and South Foreland, where it runs tide and half-tide, i. e. it is either ebb or flood in that part of the Downs three hours before it is so off at sea: a certain sign, that though the tide of flood runs aloft, yet the tide of ebb runs under-foot, i. e. close by the ground; and so at the tide of ebb it will flow under-foot.

This he confirms by an experiment in the Baltic Sound, communicated to him by an able seaman present at making it: being there, then, with one of the king's frigates, they went with their pinnace

into the mid-ſtream, and were carried violently by the current. Soon after that, they ſunk a baſket with a large cannon-bullet, to a certain depth of water, which gave check to the boat's motion; and ſinking it ſtill lower and lower, the boat was driven ahead to the windward, againſt the upper-current; the current aloft not being above four or five fathom deep. He added, that the lower the baſket was let down, the ſtronger the under-current was found.

From this principle, it is eaſy to account for that vaſt draught of water continually pouring in with the current out of the Atlantic into the Mediterranean, through the ſtreights of Gibraltar; a paſſage about twenty miles broad; yet without any ſenſible riſing of the water along the coaſts of Barbary, &c. or any overflowing of the lands, which there lie very low.

CURRENT, in navigation, may be defined, a certain progreſſive motion of the water of the ſea, in ſeveral places, either quite down to the bottom, or to a certain determinate depth, by which a ſhip may happen to be carried forward more ſwiftly, or retarded, in her courſe, according to the direction or ſetting of the current, in, with, or againſt, the courſe of the ſhip.

The method of finding the ſetting and drift of a current is thus: they firſt fix their boat, by throwing out a triangular piece of wood, with a piece of lead faſtened to it, and tied to the ſtem of the boat with a cord, and letting it ſink ſixty fathom, or more; or ſometimes, by a kettle tied by the bowl, and ſunk at the other: by either of theſe means, the boat is brought to ride as at anchor; which done, the log is hove, the glaſs turned, and as the log-line veers out, the drift of the log is ſet with the compaſs.

This ſhews whether there be any current, or none; and if any, which way it ſets, and at what rate it drives, obſerving, however, to add ſomething to the velocity for the boat's drift; for though ſhe appears to ſtand ſtill, yet, in reality, ſhe is found to move. This addition experience has thus determined; if the line ſhe rid be ſixty fathom, a third part of the drift is to be added; if eighty fathom, a fourth; if an hundred, a fifth.

If a ſhip ſail along the direction of a current, it is evident the velocity of the current muſt be added to that of the veſſel: if her courſe be directly againſt the current, it muſt be ſubſtracted; if ſhe ſails athwart the current, her motion will be compounded with that of the current, and her velocity augmented, or retarded, according to the angle of her direction with that of the direction of the current, i. e. ſhe will proceed in the diagonal of the two lines of direction, and will deſcribe or paſs through that diagonal in the ſame time wherein ſhe would have deſcribed either of the ſides, by the ſeparate forces.

Suppoſe a ſhip ſails NE. 30 miles, in a current ſetting ESE. 20 miles, in the ſame time; required her true courſe and diſtance?

GEOMETRICALLY.

Having drawn the compaſs NESW, (Plate XL. *fig.* 2.) let A be the place of the ſhip, and draw the NE. line AB = 30; then will B be the place the ſhip would have arrived at, if there had been no current. From B draw the line BC parallel to the ESE. line A*c*, making it equal to 20 miles, the current's drift; then will C be the ſhip's true place, the angle NAC her true courſe, and AC her true diſtance.

ARITHMETICALLY.

In the triangle ABC are given the ſide AB = 30 miles, the ſide BC = 20 miles, and the angle ABC = 112°. 30′. = angle *d*A*c* = diſtance between the SW. and ESE. lines; to find the angle BAC, and the ſide AC.

1. To find the angle A, it will be, As the ſum of the ſide AB and BC = 50 — — 1.6989700
Is to their difference = 10 — — 1.0000000
So is the tangent of the half ſum of the angles A and C = 33°. 45′. 9.8448926
To the tangent of half their difference = 7°. 37′. — — 9.1259226

Whence the angle A will be = 26°. 80′. which, being added to the angle NAB, the courſe ſteered, will give the angle NAC, or true courſe = 71°. 08′. or ENE. a quarter eaſterly nearly.

To find the ſide AC, the ſhip's true diſtance, it will be, As the ſine of the angle A = 26°. 08′. — — 9.6490203
Is to the ſide BC — = 20 — 1.3010300
So is the ſine of the angle B = 112°. 30′. 9.9656153
To the ſide AC, the diſt. required = 414 1.6176250

Suppoſe a ſhip, making her way good within 7 points of the wind, is bound to a port lying directly to windward or NNE. diſtant 100 miles, and a current under-foot ſetting N. by W. 45 miles in the time the ſhip ſails 55 miles; required her true courſe and diſtance on each tack to gain her intended port, as alſo her diſtance ſhe muſt ſail by the log.

GEOMETRICALLY.

Having drawn the compaſs NESW. (*fig.* 2.) let A be the place ſailed from; draw the NNE. line AB equal to 100 miles, then will B repreſent the port the ſhip is bound to. Draw the lines AG, A*g*, at ſeven points diſtant from the wind line AB, and make each = 55 miles, the diſtance ſailed by the log during the experiment; through G and *g* draw the lines GD, *g d*, parallel to the W. by N. line A *m*, the ſetting of the current, making each = 45 miles, the drift of the current during

the experiment, and draw the lines A D and A *d*; then will D or *d*, according as she sailed upon the larboard or starboard tack, be the true place of the ship at the end of the experiment, or while she sails 55 miles by the log. From B draw the lines B C and B *c*, the former parallel to A *d*, and the latter parallel to A C, continuing them till they meet the lines A C and A *d* in C and *c*. The problem being thus constructed, the several requisites may be measured by the line of chords and equal parts. For if the ship sails first on the larboard tack, continuing her course till she has sailed by the log the distance A H, then will her true place be C, her true course the angle N A C, and her true distance A C; then getting her starboard tacks on board, and standing to the westward, when she has sailed by the log the distance C *n* = A *b*, she will arrive at her intended port; for then her true place will be B, her true course the angle N A *c*, and her true distance B C = A *c*. But if she first sail on the starboard tack, then must she sail by the log the distance A *b*, whereby her true place will be *c*; then getting her larboard tacks on board, and standing to the eastward, till she has sailed by the log the distance *c p* = A H, she will arrive at her intended port; for then her true place will be B, and her true distance *c* B = A C.

ARITHMETICALLY.

1. In the oblique-angled triangle A G D are given the side A G = 55, the side G D = 45, and the angle A G D = 67°. 30′. whence the angle G A D may be found = 47°. 40′. and the side A D or distance sailed during the experiment = 56.25; and because the line A C is nearer N, than the line A G, by the angle D A G; therefore from the angle N A G = 101°. 15′. take the angle D A G = 47°. 40′. the remainder = 53°. 35′. or something more than N E. ¾ easterly, will be the true course on the larboard tack.

2. In the triangle A B C are given the angle B A C = 22°. 30′. the angle A C B = 91°. 11′. the angle C B A = 57°. 44′. and the side A B = 100; whence the sides A C and B C, the respective distance on each tack, may be found, the former or A C = 85.07, and the latter or B C = 51.64.

To find the distance sailed by the log on each tack to gain the port.—Because the triangles A C H and A D G are similar, it will be as A D = 56.24 : A C = 85.07 :: A G = 55 : A H = 83.1, the distance she must sail on her larboard tack: and because the triangles A *d g* and A *c h* are similar, it will be, as A *d* = 91 : A *c* = 51.64 :: A *g* = 55 : A *b* = 31.2 = C *n*, the distance she must sail on her starboard tack.

CURRIERS, those who dress and colour leather after it comes from the tan-yard. See the article SKINNERS.

CURRYING, the method of preparing leather with oil, tallow, &c.

CURSITOR, a clerk belonging to the court of chancery, whose business is is to make out original writs. In the statute 18 Edw. III. they are called clerks of course, and are twenty-four in number, making a corporation of themselves. To each of them is allowed a division of certain counties, into which they issue out the original writs required by the subject.

CURSOR, in mathematical instruments, is any small piece that slides, as the piece in an equinoctial ring-dial that slides to the day of the month; the little label of brass divided like a line of sines, and sliding in a groove along the middle of another label, representing the horizon in the analemma; and likewise a brass point screwed on the beam-compasses, which may be moved along the beam for the striking of greater or less circles.

CURTAILING, in farriery, is the docking or cutting off a horse's tail.

This practice is no where so much used as in England, it being a popular though false opinion, that the taking away the tail, makes the horse's chine or back much stronger, and more able to support a burden.

CURTAIL-DOUBLE, a musical wind instrument, like the bassoon, which plays the bass to the hautboy.

CURTAIN, or CURTIN, in fortification. See the article CURTIN.

CURTATE DISTANCE, in astronomy, the distance between the sun and that point where a perpendicular, let fall from a planet, meets the ecliptic.

CURTATION, in astronomy, is the difference between the distance of a planet in its orbit from the sun, and its distance from him when referred to the ecliptic, which is always less in the latter case than in the former.

CURTEYN, *Curtana*, in the British customs, king Edward the Confessor's sword, borne before the prince at coronations: its point is said to be broken off, as an emblem of mercy.

CURTIN, CURTAIN, or COURTIN, in fortification, is that part of the rampart of a place which is betwixt the flanks of two bastions, bordered with a parapet five feet high, behind which the soldiers stand to fire upon the covert-way and into the moat. As it is the best defended of any part of the rampart, besiegers never carry on their attacks against the curtain, but against the faces of the bastions, because of their being defended only by one flank. See the article FLANK.

Angle of the CURTIN, that contained between the curtin and the flank.

Complement of the CURTIN. See the article COMPLEMENT.

CURVATOR,

CURVATOR Coccygis, in anatomy, a name given by Albinus to a muſcle of the coccyx, diſcovered by himſelf, and not deſcribed by any other author.

It ariſes with a double head, one from the inner, and the other from the lower and lateral part of the os ſacrum; and deſcending, terminates in three extremities. He gave the name from its office, which is the bending the coccyx.

CURVATURE *of a Line*, is that peculiar manner in which it is bent, and from which it is known to be a curve of ſome particular property.

CURVES, in geometry, are lines continually bending in different directions, ſo as to admit of being cut in more places than one by a right line, and according to the number of times which this can happen; as twice, thrice, four times, &c. the curve is ſaid to be of the firſt, ſecond, third, &c. order. For if a line can but be cut once, it muſt of neceſſity be a right line, and then comes not under this denomination. It muſt alſo be obſerved, that as often as the above circumſtance happen in any curve, ſo high will the dimenſions of the higheſt power in the equation of that curve run when expreſſed in an algebraic manner.

The doctrine of curves, and of the figures and ſolids generated by them, is very extenſive and intricate, and conſtitutes what is called the higher geometry, and into which they are divided into two ſorts, algebraical, or geometrical, and tranſendental. All or moſt of the latter kind will be more particularly treated of in this Dictionary, under their reſpective names, or the properties they are moſt remarkable for: as to the former, their number is infinite; and as every one of them require a different way of managing them, it is to no purpoſe to ſay more of them in a work of this nature.

CURVET, or Corvet, in the manege, an air in which the horſe's legs are raiſed higher than the demivolt; being a kind of leap up, and a little forwards, wherein the horſe raiſes both his fore legs at once, equally advanced, when he is going ſtraight forward and not in a circle, and as his fore legs are falling, he immediately raiſes his hind legs, equally advanced, and not one before the other: ſo that all his four legs are in the air at once; and as he ſets them down, he marks but twice with them.

CURVILINEAL, a term applied to thoſe figures that are bounded by curve lines.

CURULE Chair, in Roman antiquity, a chair adorned with ivory, wherein the great magiſtrates of Rome had a right to ſit and be carried.

CUSCUTA, dodder, in botany, a genus of plants, whoſe corolla conſiſts of a ſingle, ovated petal, a little longer than the cup, divided into four obtuſe ſegments at the mouth: the pericarpium is fleſhy, roundiſh, and bilocular, opening horizontally: the ſeeds are two in number.

The ancients recommended it as a purge: however, we eſteem it more as an attenuant and aperient in obſtructions of the viſcera, in jaundices, dropſies, and other chronic diſeaſes.

CUSPS, in aſtronomy, the points or horns of the moon, or any other luminary.

CUSP, in aſtrology, the firſt point of each of the twelve houſes, in a figure or ſcheme of the heavens.

CUSPIDATED Plants, in botany, are ſuch plants whoſe leaves are pointed like a ſpear.

Cuspidated *Hyperbola*, that whoſe points concur in the angle of contact, and there terminate. See Hyperbola.

CUSTOM, a very comprehenſive term, denoting the manners, ceremonies, and faſhions of a people, which having turned into habit, and paſſed into uſe, obtains the force of laws; in which ſenſe it implies ſuch uſages as, though voluntary at firſt, are yet, by practice, become neceſſary.

Cuſtom is hence, both by lawyers and civilians, defined *lex non ſcripta*, a law, or right, not written, eſtabliſhed by long uſage, and the conſent of our anceſtors: in which ſenſe it ſtands oppoſed to the *lex ſcripta*, a law, or the written law.

Custom *of Merchants*.—If a merchant gives a character of a ſtranger to one who ſells him goods, he may be obliged to ſatisfy the debt of the ſtranger for the goods ſold, by the cuſtom of merchants.

Customs, in commerce, the tribute or toll paid by merchants to the king, for goods exported or imported: they are otherwiſe called duties. See Duty.

Custom-House, an office eſtabliſhed by the king's authority in maritime cities, or port towns, for the receipt and management of the cuſtoms and duties of importation and exportation, impoſed on merchandiſes, and regulated by books of rates.

Custom-Officers ſhall not have any ſhips of their own, nor may they uſe merchandiſe, factorage, nor keep a tavern, &c.

CUSTOMARY Tenants, in law, ſuch tenants as hold by the cuſtom of the manor, as their ſpecial evidence. Theſe were anciently bond-men, or ſuch as held *tenura bandagii*.

CUSTOS, in muſic, the ſame with moſtra or index.

Custos Brevium, the principal clerk belonging to the court of Common-pleas, whoſe buſineſs it is to receive and keep all the writs made returnable in that court, filing every return by itſelf: and at the end of each term, to receive of the prothonotaries all the records of the Niſi Prius, called the poſteas.

Custos Rotulorum, an officer who has the cuſtody of the rolls and records of the ſeſſions of peace, and alſo of the commiſſion of the peace itſelf.

CUTANEOUS, in general, an appellation given to whatever belongs to the cutis, or skin: hence we meet with cutaneous caruncles, disorders, eruptions, &c. See the articles CARUNCLE, CUTIS, CUTICLE, ITCH, &c.

CUTICLE, *Cuticula*, in anatomy, a thin membrane, closely lying upon the skin, or cutis, of which it seems a part, and to which it adheres very firmly, being assisted by the intervention of the corpus reticulare.

CUTICULAR, the same with cutaneous. See the article CUTANEOUS.

CUTIS, the skin, in anatomy, the universal integument of the body, or a substance made up of several kinds of tendinous, membranous, vascular, and nervous fibres, the intertexture of which is so much the more wonderful, as it is difficult to unfold; for their directions are as various as those of the stuff of which an hat consists. This texture is what we commonly call leather, and it makes the body of the skin. It is not easily torn, may be elongated in all directions, and afterwards recovers itself: on the posterior parts of the body it is thicker and more lax than on the fore parts; and on the palms of the hands and soles of the feet, it is both very thick and very solid. It is generally more difficult to be pierced by pointed instruments in the belly than in the back.

The outer surface of this substance is furnished with small eminences, which anatomists call papillæ, in which the capillary filaments of the cutaneous nerves terminate by small radiated pencils. The greatest part of these papillæ is flat, of different breadths, and separated by sulci, which form a kind of irregular lozenges. The papillæ of the palm of the hand, sole of the foot, and of the fingers and toes, are higher than the other parts of the body; but they are likewise smaller, closely united, and placed endwise in particular rows, which represent all kinds of lines. The papillæ appear to be surrounded at their bases by a soft, mucilaginous substance, called corpus reticulare, or mucosum, which fills the interstices between them, and represents a kind of net-work, the meshes of which surround each papilla; this reticular or vascular texture is of various forms and figures in the different parts of the body.

The inner surface of the skin is covered by very small tubercles, commonly called cutaneous glands, and they are likewise termed glandulæ miliares, from their resemblance to millet seeds. These tubercles are partly fixed in small fossulæ, in the substance of the skin, which answer to the same number of small cavities in the corpus adiposum. Their excretory ducts open on the outer surface of the skin. The greatest part of them furnishes sweat, and others a fatty oily matter, of different thickness, which M. Morgagni calls fandulæ sebaceæ. The late M. Duvernoy demonstrated to the Royal Academy, that the structure of some of these cutaneous glands resembled the circumvolutions of small intestines, plentifuly stored with capillary vessels.

Besides these corpuscles, there are other small solid bodies, almost oval, contained in the substance of the skin; these are the roots or bulbs from whence the hairs arise.

Besides several considerable openings in the skin, it is perforated by an infinite number of small holes, called pores, which are of two kinds; some are more or less perceivable by the naked eye, such as the orifices of the milky ducts of the mammæ, the orifices of the excretory canals of the cutaneous glands, and the passages of the hairs.

The other pores are imperceptible to the naked eye, but visible through a microscope: and their existence is likewise proved by the cutaneous transpiration, and by the effects of topical applications; and from these two phænomena they have been divided into arterial and venous pores.

There are different adhesions and folds of the skin in different parts of the body.

The outside of the skin is covered by a thin transparent web, closely joined to it, which is called epidermis, cuticula, or scarf-skin.

The substance of the cuticula appears to be very uniform on the side next the skin, and to be composed, on the other side, of a great number of very fine, small, squamous laminæ: this substance is very solid and compact, but yet capable of being extended and thickened. The origin of the epidermis is as obscure as its regeneration is evident, sudden, and surprising. The epidermis adheres very closely to the cutaneous papillæ, but still closer to the corpus reticulare; and they seem to be true portions or continuations of each other. It covers the skin through its whole extent, except at the places where the nails lie; it is marked with the same furrows and lozenges as the skin, and has the same openings and pores. The epidermis seems to insinuate itself into the small pores, in order to complete the excretory tubes of the cutaneous glands. The fossulæ of the hairs have likewise the same productions of the epidermis; and it seems to give a sort of coat to the hairs themselves: and lastly, the imperceptible ducts of the cutaneous pores are lined by it.

The uses of the skin are numerous: 1. To surround, cover, and defend the parts that lie underneath it. 2. To be the organ of feeling. 3. To be an universal emunctory to the body, cleansing the blood of its redundancies, by the means of sweat and perspiration; while these, at the same time, serve to prevent the acidity or dryness of the cutis itself.

CUTTER, in naval affairs, a small vessel used to navigate in the channel of England: they have com-

commonly one maſt, and are rigged as ſloops: ſome of theſe are ſmugglers, and ſome veſſels in the king's ſervice employed to catch the ſmugglers.

CUTTING, in heraldry, is uſed for the dividing a ſhield into two equal parts, from right to left, parallel to the horizon, or in the feſſe-way.

CUTTING, in painting, the laying one ſtrong lively colour over another, without any ſhade or ſoftening. The cutting of colours hath always a diſagreeable effect.

CUTTING, in ſurgery, the operation of extracting the ſtone out of the human body by ſection.

CUTTING *in Wood*, a particular kind of ſculpture, or engraving, denominated from the matter whereon it is employed.

The art of cutting in wood was certainly carried to a very great height about one hundred and ſixty years ago: at preſent it is very low in eſteem, as having been long neglected, and the application of artiſts wholly employed on copper, as the moſt eaſy and promiſing province. The cutter in wood needs no other inſtruments than little ſharp knives, chiſſels, and gravers of different ſizes.

The firſt thing he does, is to take a plank or block of pear-tree, or box, which he prepares of the ſize and thickneſs intended, and makes it very even and ſmooth on the ſide to be cut: on this block he draws the deſign with a pen, or pencil, juſt as it ought be printed. Thoſe who cannot draw their own deſigns, make uſe of thoſe done by another, which they faſten on the block with paſte, the ſtrokes or lines being turned towards the wood: when the paper is dry, they waſh it gently over with a ſponge dipped in water, which done, they take off the paper by degrees, ſtill rubbing it a little with the tip of the finger, till there is nothing left on the block but the ſtrokes of ink that form the deſign, which marks out ſo much of the block as is to be ſpared, or left ſtanding; the reſt they cut off, and take away as curiouſly as they can with the point of their ſharp inſtruments.

CUTTINGS, in gardening, are branches of trees, ſhrubs, &c. cut off in order for their ſtriking root, and becoming new plants: numbers of plants are raiſed by cuttings. Thoſe which are deciduous and hardy, the autumn is beſt for this operation; but evergreen cuttings ſhould be planted in the ſpring.

In providing cuttings, it is not amiſs to leave a knob of the former year's wood on, particularly of thoſe plants which grow freely. With very tender and herbaceous plants, the young branches ſhould be cut juſt below the joint, and may be ſtuck in a pot or border, and covered air-tight with a glaſs; this method will greatly promote their taking root, and is done in the ſummer months. With ſome ſorts it is neceſſary to plunge them in a moderate heat to facilitate their rooting; and it may be remarked that the young ſhoots of the lateſt growth are moſt proper for this operation.

CUT-WATER, in naval architecture, the foremoſt part of the prow of a ſhip, or that part which firſt divides the fluid. See the article STEM.

CYANUS, bottle-flower, in botany, a plant which grows wild in corn-fields; the ſtalks are angular, hollow, covered with down and branched; the lower leaves are ſinuated, and not much unlike thoſe of dandelion, but the others are narrow and long. The flower has a ſcaly hairy cup, and the diſk almoſt flat, but the outer florets round the border are tubulous and deeply cut; the colour of them is generally blue, though there are varieties with other colours.

This plant is claſſed among the centaurys by Linnæus.

It is ſaid to be alexipharmic and uterine, and the water diſtilled from the flowers is of ſervice in inflammations of the eyes.

CYCLAMEN, ſow-bread, in botany, a genus of plants, whoſe flower is monopetalous; the tube is ſubgloboſe, double the ſize of the cup; the limb is large, and turns upwards, and is divided into five ovato-lanceolate ſegments; in the tube are placed five ſmall filaments, terminated with ſtrait pointed antheræ. The fruit is a roundiſh berry, opening in five parts at top, incloſing many roundiſh angular ſeeds.

The common cyclamen has a thick, orbicular, fleſhy root, ſomewhat flattiſh, white within and blackiſh without; it has a pungent, burning, diſagreeable taſte. From the root ariſes a number of heart-ſhaped leaves, marked with black in the middle; theſe grow on foot-ſtalks about ſix or ſeven inches high. Theſe flowers riſe immediately from the root, with long, fleſhy pedicles. When the flower falls off, their foot-ſtalks twiſt up like a ſcrew, incloſing the germen in the center, and bends down to the ground between the leaves, which ſerves as a protection to the ſeed.

In medicine, the root is the part which is uſed; it is ſaid to open and deterge very powerfully, for which reaſon it is recommended in the jaundice, gravel, and all obſtinate obſtructions. Externally it hath been uſed to diſcuſs ſcrophulous tumours, applied in the form of a cataplaſm; and for this intention its acrimony and pungency is more fitting than for internal uſes.

There are other ſpecies of cyclamen, which are more tender than the above-mentioned, therefore require to be ſheltered in winter with us. They are all propagated from ſeeds, which ſhould be ſown when ripe.

CYCLE, in chronology, a certain period, or ſeries of years, months, days, &c. which when it has run regularly from the firſt to the laſt, returns again to the firſt, and thus circulates perpetually.

CYCLE *of the Sun*, or dominical letter cycle, is a revolution of twenty-eight years, after which interval the days of the week return on the ſame days of

of the month of the Julian or old ſtyle; but the reformation of the calendar, made by pope Gregory XIII. has made a ſad breach in this cycle, by reducing every hundredth year, which in the Julian ſtyle was always leap year, to a common one of 365 days.

CYCLE *of the Moon*, or golden number, is a cycle, or period of nineteen years, after which period, the ſame lunar aſpects, with reſpect to the ſun, return on the ſame days of the month, which they did in the preceding period. The principal uſe of this cycle is for finding the time for obſerving the feaſt of Eaſter; and was eſtabliſhed by the council of Nice, who at that time thought ſo highly of it as to have the numbers ſet down in letters of gold, from whence it had the name of the golden number.

CYCLE *of Indiction*, is a period of fifteen years, uſed by the Romans for determining the time of particular payments by the ſubjects of the republic, and was firſt founded by Conſtantine in the year of Chriſt 312.

CYCLOID, in geometry, one of the mechanical or tranſcendental curves: it is ſuppoſed to be generated in the following manner.

If a circle (Plate XL. *fig.* 3.) in a vertical poſition rolls along the horizontal line A B (as the wheel of a carriage does upon the road) till it has made one revolution, that point of the circle, as A, which touched the plane, will riſe up from the line, and be at *a* when the circle has rolled half way, having deſcribed the curve A *a*, from whence (as the circle goes on) it goes downwards in the ſame kind of curve, till it comes to touch the line A B at B; the point C, which was uppermoſt at the beginning of the motion, having been down at *c* when A was at *a*, and now being returned to *k* when the circle is in the ſame poſition as before its revolution began. The whole curve A *a* B ſo deſcribed is called a cycloid, and the circle A C the generating circle, and the line A B the baſe of the cycloid.

It is evident from the formation of the cycloid, that the baſe of the cycloid is equal to the circumference of the generating circle. Several other properties of the cycloid have been demonſtrated by mathematicians, whoſe demonſtrations it would be tedious to repeat here; therefore we ſhall take them for granted, and mention them as we have occaſion for them in our concluſions about the pendulum, and other, the more particular properties and uſes of this curve.

Let us now invert the cycloid, ſo as to have A B (*fig.* 4.) the baſe at top, and the cycloid underneath. It has been demonſtrated by ſeveral, that if from any point in the cycloid, as E or *p*, there be drawn a line parallel to the baſe, and from the point where that line cuts the generating circle when it has performed half its revolution (that is, when it is at G) there be drawn a chord ſuch as *e* D or *q* D, the intercepted arc of the cycloid, as E D or *p* D will be double the chord *e* D or *q* D; and ſo one half of the cycloid, as A D will be double the diameter G D of the generating circle. Now it has been ſhewn by ſeveral that a body will fall in the ſame time in the diameter G D, and in the chords *q* D, *e* D, a body muſt fall in the arcs A D *p* D and *e* D in equal times; becauſe each of them is the double of the above-ſaid lines G D, *q* D and *e* D; ſo that when a pendulum ſwings in a cycloid; all the vibrations, however unequal, are iſochronal.

Before we quit this ſubject, it may not be improper to mention a remarkable property of the cycloid, which is this, viz. that it is the line of the ſwifteſt deſcent; that is, if a body is to move from A to D, there is no line of any kind which can be drawn from the upper to the lower of thoſe points, along which a body will deſcend ſo faſt as in the ſemi-cycloid A D; neither an arc of a circle, nor even the ſtraight line A D, though it be ſo much ſhorter; for the body at firſt ſetting out from A deſcends in ſo ſteep a direction (that is, is ſo much acted upon by gravity) that it acquires a great velocity, ſo as to carry it the more ſwiftly in the lower part of the curve which is leſs ſteep: and a circular arc which would be more ſteep at bottom is leſs ſo at top. If an inclined line as A F, be drawn from A beyond the loweſt point of the cycloid, and a body goes down that line, whilſt another runs from the ſame point along the cycloid, the greater celerity of the body in the cycloid will appear more evidently. This property, and that of having the deſcent of a body from any part of the (inverted) cycloid to the bottom, exactly in the ſame time, will be illuſtrated by the following experiments.

EXPERIMENT I. Plate XL. *fig.* 5.

The machine B H M D D, repreſented by the figure, is made of wood about ten inches high, two foot long and two inches thick. From I to F it is cut into a channel as wide at bottom as at top, in the form of a ſemi-cycloid inverted, the loweſt point being at F, from whence the channel is continued horizontally for the length of a foot from F to G, the walls of the channel being H H and I I, and this channel is very ſmooth and divided into two channels by a thin upright braſs partition L L from the top between H and I to the farther end at G. Upon the partition are marked diviſions, which from F to G are equal, but unequal from F to I, in ſuch manner as to denote equal heights, H the beginning of the channel is nine inches above the level of F, O O are two wooden ſtops for the channels, and to be fixed in any place by means of a ſkrew at the end of each of them. The whole inſtrument may be ſet upright and horizontal by means of three ſkrews ſuch as C, C, and the plummet N M.

Two braſs balls, of half inch diameter each, are to move in the two channels.

Fix the two ſtops exactly at F, and the braſs balls, though you let them go from different parts of their reſpective cycloidal channels, will ſtrike them at the ſame time; which will alſo be very ſenſible to any one who holds a finger in each channel at F, whilſt another perſon lets the balls run down from unequal heights.

Now let the ſtops be ſhifted, and one of them be fixed four inches beyond F towards G, and the other ſix inches beyond F; and let the two balls fall at once, the one from the height of four inches, and the other from the height of nine. That which falls from four inches in height, will go four inches beyond F; and that which falls from nine inches in height, will go ſix inches beyond F, each ſtriking the obſtacle in its own channel exactly in the ſame time as the other. Four and nine are the ſpaces fallen through, whoſe roots two and three expreſs the reſpective velocities of the balls, which are ſhewn by one of them running four inches in the horizontal part of its channel, the other runs ſix inches in the other horizontal channel.

EXPERIMENT II. Plate XL. *fig.* 6.

AEC*b* is another machine with a cycloidal channel, wherein the whole cycloid is hollowed in from B to *b*, its loweſt part being at C. There is a ſtreight channel A *a* moveable round the point A as a center to apply on the back-ſide of the cycloid as the machine ſtands upright, ſo that its channel may be in the plane of any chord drawn from the point A to any part of the cycloid. Let this trough or channel be firſt ſet in the line AC; then let one of the balls fall from B in the cycloidal channel, whilſt the other begins at the ſame time to fall from the ſame level in the ſtreight channel, and you will obſerve, that the ball running down in the cycloid will be a good way beyond C, when the ball running in the ſtreight channel is juſt got to it; as may ſtill be made more ſenſible by fixing one of the ſtops abovementioned (in the explanation of the laſt figure) over-againſt C in the ſtreight channel, and the other between C and *b* in the cycloidal channel. If the ſtreight channel be fixed beyond the point C as at A *a*, the ball in the cycloid will come from B to *b* and be down again at C when the other is come from A in a ſtreight line to G.

CYCLOIDAL, of, or belonging to a cycloid.

CYCLOPÆDIA, or ENCYCLOPÆDIA. See ENCYCLOPÆDIA.

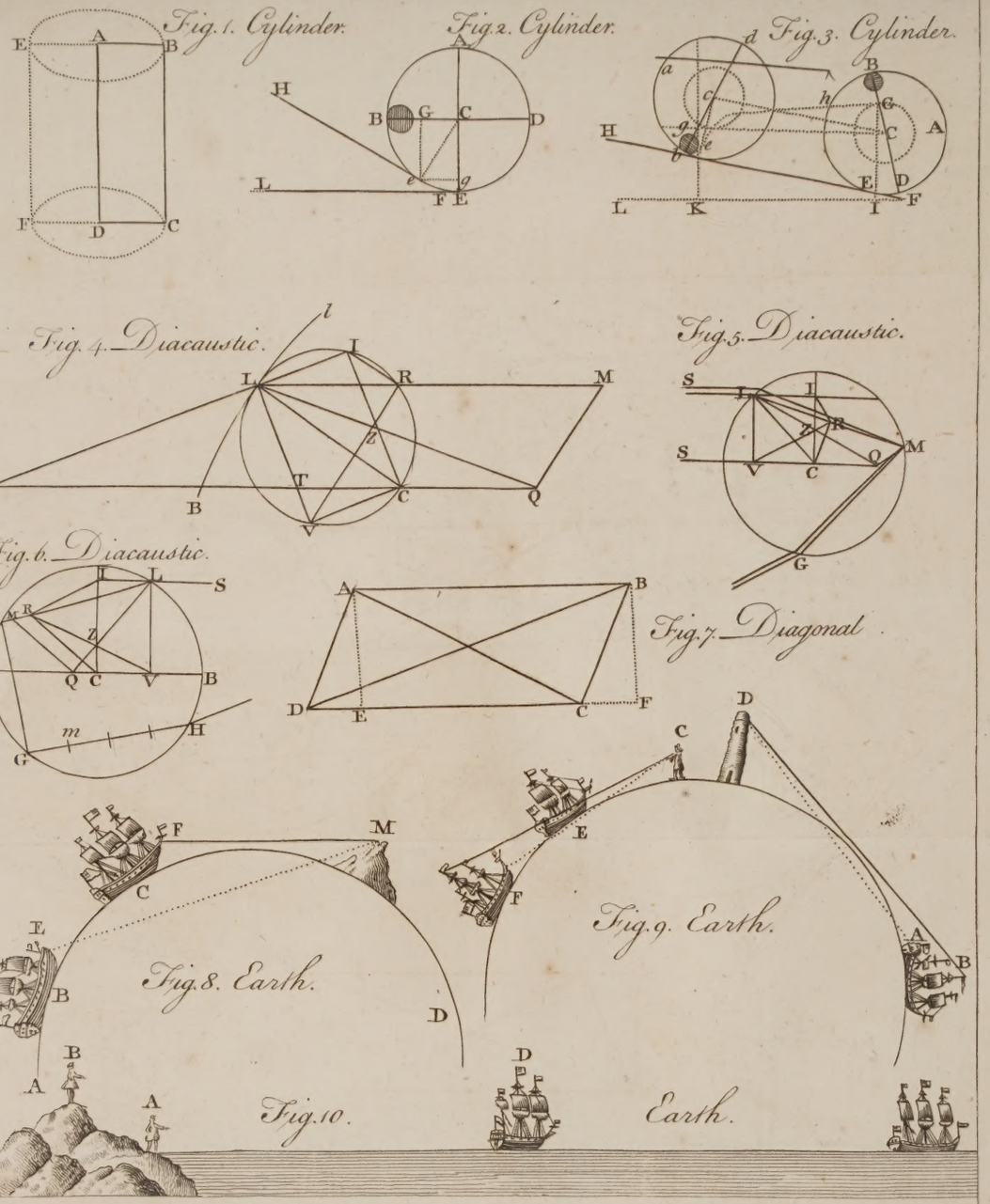
CYDER, or CIDER, an excellent drink made of the juice of apples, eſpecially the more curious table kinds; the juice of theſe being eſteemed more cordial and pleaſant than that of the wild and harſh kinds.

CYGNUS. See the article SWAN.

CYGNUS, in aſtronomy, a conſtellation of the northern hemiſphere, conſiſting, according to Ptolemy's catalogue, of 27 ſtars, Tycho's 19, and in the Britiſh catalogue of 107; but in the following of 81.

The fabulous hiſtory of this conſtellation, according to the poets, is thus related. Jupiter falling in love with Læda, the wife of Tyndarus, king of Oebalia, and not knowing in what manner to ſatisfy his luſtful deſires, without expoſing himſelf, procured Venus to transform herſelf into an eagle, and himſelf into the form of a ſwan; therefore flying from the eagle as from his natural enemy that earneſtly purſued him, lighted in the lap of Læda, under a pretence of avoiding the eagle: Læda not knowing who it was under the ſhape of the ſwan, and conſequently not fearing or apprehending any danger, went to ſleep, claſping the ſwan in her arms cloſe to her boſom; which opportunity Jupiter ſeized, and in raptures enjoyed the charms of the beautiful Læda; and in memorial of the great pleaſure he received under the form of a ſwan, placed the figure of this bird among the ſtars for a conſtellation.

Order.	Magn.	Name.	Bayer Let.	Right Aſcenſion	Diſtance from Nor. Pole.	Var. in Right Aſcen.	Var. in Declination.
				° ′ ″	° ′ ″	″	″
1	4		κ	287.52.41	37. 3.50	20.0	6.2
2	5			288.37.12	60.50. 5	34.0	6.3
3	6			288.51.24	65.15.32	36.0	6.4
4	6			289.19.35	54. 8.41	31.0	6.5
5	6			289.19.35	54. 8.41	31.0	6.7
6	3.4		β	290.13.25	62.31. 2	33.2	6.9
7	6			290.24.36	38. 8.53	21.2	7.0
8	6			290.40. 0	56. 1.44	32.0	7.1
9	6			290.40. 0	56. 1.44	32.0	7.1
10	6		ι	290.54. 7	38.46.15	22.9	7.2
11	6			291.45.16	53.34.25	31.0	7.4
12	5		φ	292.26.28	60.23.13	34.0	7.5
13	4		θ	292.29.29	40.19.38	23.2	7.7
14	6			292.53.45	47.43.10	28.0	7.8
15	6			293.52.18	53.12.55	31.0	7.9
16	6			293.50.50	40. 1.11	23.2	7.9
17	5			294.17.55	56.48.26	33.0	8.1
18	3.4		δ	294.20.23	45.26.12	27.0	8.3
19	6			295.28.40	51.52.59	30.4	8.5
20	5.6			296. 8.50	37.36.12	22.0	8.9
21	6		η	296.47.51	55.32.17	32.4	9.0
22	6			296.46. 8	52. 9. 7	31.0	9.0
23	6			297. 6.12	33. 5.19	18.0	9.1
24	5		Ψ	297. 6.12	33. 5.19	18.0	9.1
25	6			297.24. 7	53.36. 1	32.0	9.4
26	6	2da ad	ε	298.37.56	40.32.51	24.4	9.6
27	5	1ma ad	b	299.20.48	54.39.49	32.2	9.7
28	5	2da ad	b	300. 5. 0	53.52. 7	32.0	9.8
29	6	3tia ad	b	301.20.43	53.54.56	32.2	9.9
30	4	1ma ad	o	301.25.10	43.53.47	27.2	10.1
31	5	2da ad	o	301.59.45	43.58.17	27.2	10.4
32	5.6			302. 0.27	43. 0.38	26.2	10.6



Hodges Sculp.

Order.	Magn.	Name.	Bayer Let.	Right Aſcenſion.	Diſtance from Nor. Pole.	Var. in Right Aſcen.	Var. in Declination.
				° ′ ″	° ′ ″	″	″
33	5,6			302. 0.27	43. 0.34	26.2	10.8
34	6	Nova 1600		302.12.45	52.41.42	32.0	10.9
35	6		m	302.19.16	55.45.11	33.0	11.0
36	6			302.20.40	53.39.21	32.0	11.0
37	3		γ	302.22.25	50.29.54	31.0	11.0
38	3			302.22.25	50.29.54	31.0	11.1
39	6		h	303.31.47	58.34.23	34.2	11.2
40	6			304 38.56	52.19.53	32.0	11.3
41	4		i	304.52.15	66.25.22	35.2	11.4
42	6			305. 1.33	54.19.49	33.0	11.5
43	5	1ma ad	ω	304.55. 5	41.23.47	26.2	11.5
44	6			305.26.47	53.51.27	32.6	11.6
45	5	2da ad	ω	305.38.45	41.50.25	27.0	11.7
46	5	3tia ad	ω	305.58.40	41.34.41	27.0	11.8
47	6		l	305.67.49	55.33.37	33.0	11.9
48	6			306.55. 4	59.15.35	35.0	12.1
49	6			307.48.56	58.32.14	35.0	12.3
50	2		α	308.16. 9	45.23.40	30.8	12.5
51	6			308.44.31	40.30.21	36.0	12.6
52	6		k	308.54.26	60. 8.51	35.4	12.8
53	3		ε	309. 5.22	56.55.13	34.4	12.9
54	4		λ	309.29.25	54.22.35	34.0	12.9
55	6			310. 9.42	44.46. 0	29.4	12.9
56	6			310.21.55	46.49.52	30.4	13.0
57	6			311.10.25	46.31.20	30.4	13.2
58	4		ν	311. 5.23	49.44.24	44.0	13.4
59	5,6	1ma ad	f	312.53.28	43.24. 5	29.2	13.6
60	6			313.10.47	44.47.33	30.0	13.7
61	6			313.54.39	52.29.20	33.4	13.8
62	6		ξ	314. 2.18	47. 0.48	31.2	13.9
63	4	2da ad	f	314.33.56	43.18. 1	30.0	14.0
64	3		ξ	315.39.38	60.44.44	36.4	14.1
65	4		τ	316.16.58	52.58.28	34.0	14.2
66	5		υ	316.59.21	56. 6. 2	35.2	14.3
67	4			316.58.50	51.35.50	33.6	14.4
68	6		A	316.58.50	51.35.48	33.6	14.5
69	6			318.44. 7	54.21.17	35.0	14.6
70	6			319.22. 3	53.54.44	35.0	14.8
71	6			320. 8. 4	54.20. 0	32.0	14.9
72	6			321.12.57	52.31.46	35.0	15.2
73	4		ϱ	321.13.46	45.26.59	32.2	15.6
74	6			321.39.17	50.29.12	34.2	15.7
75	6			322.40.19	47.48. 2	33.6	15.9
76	6			322.57.25	50.16.22	34.4	16.0
77	6			323. 9.21	50. 0.34	34.4	16.0
78	3,4			323.19.45	62.19.58	38.0	16.0
79	6			323.19.45	62.19.54	38.0	16.1
80	4	1ma ad	π	323.23.31	39.53.31	30.4	16.1
81	5	2da ad	π	324.28.45	41.47.10	31.4	16.3

CYLINDER, in geometry, a ſolid ſuppoſed to be generated by the rotation of a parallelogram round one of its ſides as an axis. Thus if the parallelogram ABCD (Plate XLI. *fig.* 1.) be ſuppoſed to revolve round the ſide AD as an axis, it is manifeſt from the figure that it will deſcribe the cylinder EBFC, whoſe altitude is equal to the length of the ſide AB, and the ſemi-diameter of its baſe equal to AB. If the parallelogram be a right-angled one, it is called right; but if it be otherwiſe, it is called a ſcalone one.

The moſt remarkable properties of the cylinder are as follow.

1. Every ſection parallel to the baſe muſt be a circle.

2. Every ſection parallel to its axis AD muſt be a parallelogram.

3. Every ſection by a plane oblique to its axis will be an ellipſis.

4. Cylinders of the ſame baſe, ſtanding between the ſame parallels, are equal.

5. If the altitudes of two right cylinders be equal to the diameters of their baſes, thoſe cylinders are to one another as the cubes of the diameters of their baſes.

6. Every cylinder is to its inſcribed ſpheroid as 3 to 2.

7. Since, by the 31ſt article, book iv. of Pardie's Elem. Geo. the area of every circle is equal to that of a right-angled triangle, one of whoſe ſides is equal to the radius of, or the circle, and the other a right-line equal to the circumference: therefore the ſuperficies of every cylinder is equal to the area of a parallelogram, one of whoſe ſides is equal to the ſum of the ſides AB and BC of its generating parallelogram, and the other a right-line equal to the circumference.

Therefore puting $a =$ AB, $b =$ BC, and $p =$ the circumference of a circle, whoſe radius is one, we have $p a^2 + p a b =$ the ſuperficies of the whole cylinder. And,

8. The ſolidity is equal to $\frac{p a^2 b}{2}$ in words, equal to product of the area of the baſe into its altitude.

Rolling-CYLINDER, in philoſophy, a cylinder which rolls upon an inclined plane.

The phænomenon of the rolling cylinder may be eaſily accounted for from what we have obſerved under CENTER *of Gravity*.

For let ABED (Plate XLI. *fig.* 2.) repreſent a ſection of a cylinder of wood, biaſſed on one ſide with a cylindric piece of lead, as B; this will bring the center of gravity out of the center of magnitude C, to ſome point G, between C and B. Let FH be an inclined plane, whoſe baſe is FL. It is evident the cylinder laid upon the plane will no where reſt but there where a perpendicular to the horizon FL paſſes through the center of gravity G, and that point of the plane E, in which the cylinder touches it; and this in all angles of inclination of the plane, leſs than that whoſe ſine is equal to CG, the radius being CD. This will happen in two

ſituations

situations ABED, and *abed*; because, when the cylinder moves, the center of gravity describing a circle round the center of magnitude C, this circle will meet the perpendicular in two points G and *g*, in each of which the center of gravity being supported, the cylinder will rest: therefore the cylinder moves from E to *e* by the descent of the center of gravity from G to *g*, in the arch of the cycloid G *hg*.

If the cylinder ABED (Plate XLI. *fig.* 3.) infisting on the horizontal line EL in the point E, has the center of gravity G in the horizontal diameter DB, it will gravitate in the perpendicular G *e*; if therefore a plane FH touch the cylinder in the point *e*, it is plain the cylinder cannot either ascend or descend on such a plane; because G, in any situation between *e*, and H or *e*, and F, will gravitate to the left or right from the point in which the cylinder touches the plane; and so will in either case bring it back to the point *e*.

CYLINDER-CHARGE, in gunnery, that part of a great gun which is possessed by the powder and ball.

CYLINDER CONCAVE, in gunnery, is all the chace of a piece of ordnance.

It may not perhaps be amiss to take notice of the remarkable resistance in concave or hollow cylinders to that of solid ones. As for example, if this question was asked, which of two sticks equal in length, and cylindrical, is the easiest to break upon the knee, that which is entirely solid, or that which is hollow, having the same quantity of matter with the other, most people would not hesitate at all to decide that the hollow stick would be the easiest to break.

Nevertheless it is quite the contrary, as soon as we consult the principles of mechanicks. When we rest a stick upon the knee to break it, we rest it by some one of its points, and it is the point diametrically opposite, which will take a circular motion about the point of support, while the fracture is made. Here then is a lever, and this point which moves circularly, describes an arch so much the greater, as it is farther distant from the point of support, or from the fixed point, and consequently it has so much more force to resist the power, which tends to make the fracture. A thicker cylinder full is then more difficult to break, not only because it contains more matter, upon which we must act, but also because the diameter of its base is greater, and the extremity of its diameter, which moves in the fracture, is farther distant from the fixed point. If this cylinder preserving the same quantity of matter, became hollow, it is visible, that its total diameter, that is, the diameter, as well of the hollow part, as of the solid, would necessarily increase, and consequently also one of the causes, which made its force, and its resistance against being broken.

Every hollow cylinder is then stronger than a full cylinder, which has only the same quantity of matter; and this, according to all appearance, is one of the reasons why the bones of animals and the culms of corn and grass are hollow.

Galileo, the first author of these sorts of inquiries, has considered in the full and hollow cylinders, having their bases formed of the same quantity of matter, only the inequality of their diameters, and consequently he has established, that the resistance of a hollow cylinder, is to that of a full cylinder, as the total diameter of the hollow one is to the diameter of the full one.

But this consideration is imperfect in this, that the extensions of the fibres of which the cylinders are composed, are not taken in. These extensions, and consequently the resistances of all the particular fibres, continually increase from the fixed point to the most distant fibre, which must break the first, and which we may suppose in the greatest extension that it can suffer. It is the sum of all these unequal resistances that makes the resistance, which all the fibres together oppose to the power, which tends to break them.

Thus the total resistance of the cylinder depends upon three things; on the quantity of matter that composes the base; on the resistance that all these fibres together bring to their extension, and on the magnitude of the diameter of the cylinder.

There remains to determine and express geometrically these magnitudes; and it is this that M. Parent has done. The circles of the base of the full cylinders must be made equal, to the full bands or zones of the hollow cylinders, and we must find the infinite sum of the unequal resistances of all the fibres, which is a particular case of the general method of M. Varignon.

M. Parent being arrived to a general formula, which contains all the possible resistances of hollow cylinders, compared to the full, has calculated upon this formula, a table, where he supposes that the total semi-diameter of a hollow cylinder is always 100 parts; and that the resistance of the full cylinder, which contains in its base as much matter as the other, is also divided into 100 parts. We see by the table,

1. That in proportion as the hollow cylinder, of which the radius can have but 100 parts of a certain determinate magnitude, has more void, and consequently less matter, it makes a greater resistance than the correspondent full cylinder. 2. That this inequality of resistance always diminishes in proportion as the hollow cylinder is less hollow, and contains more matter; that, for example, a cylinder, of which the void is 99 radius, and 1 in thickness, and to which consequently a full cylinder answers, which is only 14 radius, has a resistance, which is to that of the full cylinder, as 848 to 100, that is, as $8\frac{12}{25}$ to 1; and that the cylinder, which has 50 in void and 50 in thickness, and to which a full cylinder of 87 radius answers, has a resistance, which

is

is to that of the full one, only as 121 to 100. 3. That the hollow cylinder of 99 void, the resistance of which, compared to that of the full one, which is 14 radius, would be, according to Galileo, $7\frac{7}{7}$ times greater, has one $8\frac{1}{2}\frac{2}{5}$ times greater, according to the hypothesis of M. Parent, which is also that of M. Mariotte.

CYLINDER VACANT, in gunnery, is that part of the hollow that remains empty, after the gun is charged.

CYLINDRICAL, something in the form of, or resembling, a cylinder: thus we say, a cylindrical column, cylindrical compasses, mirrors, &c.

CYLINDROID, in geometry, a solid body approaching to the figure of a cylinder, but differing from it in some respect, as having the bases elliptical, but parallel and equal.

The word is formed from the Greek, κυλινδρος, a cylinder, and ειδος, resemblance.

CYMA, or CYMATIUM, in architecture. See CYMATIUM.

CYMA, in botany, the tender stalk which herbs send forth in the beginning of the spring; particularly those of the cabbage kind.

CYMATIUM, in architecture, a member, or moulding of the corniche, the profile of which is waved; that is, concave at top, and convex at bottom. See the article CORNICHE.

Tuscan CYMATIUM consists of an ovalo or quarter-round. Philander makes two Doric cymatiums, of which this is one. Baldus calls this the Lesbian astragal.

Doric CYMATIUM is a cavetto, or a cavity less than a semicircle, having its projecture subduple to its height. See article DORIC.

Lesbian CYMATIUM, according to Vitruvius, is what our architects otherwise call talon, viz. a concavo-convex member, having its projecture subduple to its height.

CYMBAL, κυμβαλον, a musical instrument in use among the ancients. The cymbal was round, made of brass, like our kettle-drums, and, as some think, in their form, but smaller, and of different use.

CYMBIFORME Os, a bone otherwise called naviculare. See NAVICULARE.

CYNANTHROPIA, in medicine, the distemper occasioned by the bite of a mad dog, wherein the patient avoids the light and every thing that is bright, and dreads the water so much, that he trembles at the sight or even the remembrance of it. See HYDROPHOBIA.

CYNARA, in botany, a genus of plants, whose flower is uniform, tubulated, and compound; the calyx is ventricose, and imbricated, with a number of fleshy, roundish squamas; the proper flower is hermaphrodite, monopetalous, and funnel-shaped, situated on an ovated germen, which afterwards becomes a single, oblong, compressed, four cornered seed, crowned with a long sessile down.

This genus includes the different species of the artichoke. See the article ARTICHOKE.

CYNICS, a sect of ancient philosophers, who valued themselves upon their contempt of riches and state, arts and sciences, and every thing, in short, except virtue or morality.

The Cynic philosophers owe their origin and institution to Antisthenes of Athens, a disciple of Socrates, who, being asked of what use his philosophy had been to him, replied, "It enables me to live with myself." Diogenes was the most famous of his disciples, in whose life the system of this philosophy appears in its greatest perfection: he led a most wretched life, a tub having served him for a lodging, which he rolled before him, wherever he went; yet he was, nevertheless, not the more humble on account of his ragged cloak, bag, and tub; for one day, entering Plato's house, at a time that there was a splendid entertainment there, for several persons of distinction, he jumped up upon a very rich couch, in all his dirt, saying, "I trample on the pride of Plato." "Yes, (replied Plato) but with greater pride, Diogenes." He had the utmost contempt for all the human race; for he walked the streets of Athens, at noon-day, with a lighted lantern in his hand, telling the people, "He was in search of a man." Amongst many excellent maxims of morality, he held some very pernicious opinions; for he used to say, that the uninterrupted good fortune of Harpalus, who generally passed for a thief and a robber, was a testimony against the gods. He regarded chastity and modesty as weaknesses; hence Laertius observes of him, that he did every thing openly, whether it belonged to Ceres or Venus, though he adds, that Diogenes only ran to an excess of impudence to put others out of conceit with it: but impudence was the characteristic of these philosophers, who argued, that what was right to be done might be done at all times, and in all places. The chief principle of this sect, in common with the Stoics, was, that we should follow nature; but they differed from the Stoics in their explanation of that maxim, the Cynics being of opinion that a man followed nature, that gratified his natural motions and appetites; while the Stoics understood right reason, by the word nature.

CYNIC SPASM, a kind of convulsion, wherein the patient imitates the howlings of dogs.

CYNOGLOSSUM, hound's tongue, inbotany, a genus of plants, whose corolla consists of a single petal, of the length of the cup; the tube is cylindric, and shorter than the limb, which is divided into five obtuse segments; the fruit consists of four roundish depressed capsules; the seed is single, of an oval figure, gibbous, acuminated, and smooth.

Its root is kept in the ſhops, and is eſteemed a pectoral and narcotic.

Some recommend it in catarrhs, the gonorrhœa, and ſcrophulous caſes.

CYNOSURA, in aſtronomy, a name given by the Greeks, to the conſtellation urſa minor.

This is the conſtellation next to the north pole.

CYNOSURUS, dog's-tail graſs, in botany, a genus of plants, whoſe corolla conſiſts of two valves; the exterior concave, longer, and ariſtated; the interior, plane, without any ariſta: the corolla ſurrounds the ſeed, which is ſingle, of an oblong figure, and pointed at each end.

CYON, or CION, among gardeners. See the article CION.

CYPERUS, in botany, a genus of plants, whoſe flower has no corolla nor any pericarpium; the calyx is an imbricated ſpike with ovated ſquamas; it contains three ſhort filaments, topped with oblong, ſulcated antheræ; the ſeed is ſingle, of a triquetrous form, acuminated, and having no villi, or hairs.

The roots of theſe plants are carminative and attenuant; they promote the menſes, and are good in all chronic caſes ariſing from obſtructions of the viſcera.

CYPHER, or CIPHER. See CIPHER.

CYPRESS, *Cupreſſus*, the Engliſh name of a genus of trees. See CUPRESSUS.

CYPRINUS, in ichthyology, a very comprehenſive genus of fiſhes of the order of the malacopytergii, the characters of which are theſe: the branchioſtege membrane on each ſide contains three ſmall bones; the mouth is toothleſs, except that towards the orifice of the ſtomach there are two ſerrated bones which ſerve inſtead of teeth.

This is a very numerous genus, comprehending the roach, tench, carp, gudgeon, barbel, chub, bream, bleak, &c.

CYPRIPEDIUM, lady's ſlipper, in botany, a genus of plants, the flower of which conſiſts of four or five very long and narrow petals; it hath ten ſhort filaments, topped with erect antheræ. The fruit is an ovate, obtuſe, three-cornered capſule, trivalvular and unilocular, which is filled with a great number of ſeeds.

CYRENAICS, *Cyrenaici*, a ſect of ancient philoſophers, ſo called from their founder, Ariſtippus of Cyrene, a diſciple of Socrates.

The great principle of their doctrine was, that the ſupreme good of man in this life is pleaſure; whereby they not only meant a privation of pain and a tranquility of mind, but an aſſemblage of all mental and ſenſual pleaſures, particularly the laſt.

CYST, the bag, or tunic, including all incyſted tumours, as the ſcirrhus, atheroma, ſteatoma, meliceres, &c.

If in extracting an incyſted tumour, the including cyſt be broke, or wounded, care muſt be taken to remove it, otherwiſe the tumour will ſpeedily return.

Indeed if the tumour be a ſcirrhus, ſarcoma, ſteatoma, or in a glandular part, the contents are hard enough to make a clean extirpation of it, notwithſtanding its including coats be wounded: but when the matter of the tumour is ſoft or fluid, by its eſcaping, the tumour will become flaccid, ſo that it will hardly be poſſible to make a clean extirpation of the cyſt, without leaving ſome fragment behind, which muſt in that caſe be brought away by dreſſing the abſceſs with digeſtives, &c. See ABSCESS.

CYSTIC, a name given to two arteries and two veins, opening into the gall-bladder. The cyſtic arteries, *cyſticæ gemellæ*, are two arteries proceeding from the right branch of the cœliac; and that trunk of the vena porta which goes into the liver affords the cyſtic veins.

CYSTIC DUCT, *Cyſticus Ductus*, a pipe that goes into the neck of the cyſtis, or gall bladder, into which ſome bilious ducts likewiſe open, and thro' which the greater part of the bile is evidently carried into the cyſtis in human ſubjects.

CYSTIC BILE, one of the two kinds of bile, being diſtinguiſhed into the cyſtic and hepatic bile.

The cyſtic bile is very bitter, thicker, and more coloured than the hepatic.

CYSTIS, in anatomy, the ſame with veſicula, or bladder. See BLADDER and VESICULA.

CYTISUS, baſe tree trefoil, in botany, a genus of plants, with a papilionaceous flower, and an oblong, obtuſe, and rigid pod for its fruit, wherein are a few compreſſed and kidney like ſeeds.

The leaves of cytiſus are eſteemed cooling and diſcutient.

Of this genus the laburnum is a ſpecies. See LABURNUM.

CZAR, a title of honour aſſumed by the great dukes, or, as they are now ſtiled, emperors of Ruſſia.

Beckman makes no doubt but they took this title, by corruption, from cæſar, emperor; and accordingly they bear an eagle, as the ſymbol of their empire, and the word CÆSAR in their arms: yet they make a diſtinction between czar and cæſar, the firſt being taken for the king's name, and the other for the emperor's.

The firſt that bore this title was Baſil, the ſon of Baſilides, under whom the Ruſſian power began to appear, about 1470.

THE END OF THE FIRST VOLUME.

A GENERAL

DICTIONARY

OF

ARTS and SCIENCES.

DAC

D One of the letters of the alphabet, the fourth in order, and the third conſonant, anſwering to the Hebrew Daleth, and Greek Delta.

As a numeral, D denotes 500; and with a daſh over it thus, $\overline{D}$, 5000. Uſed as an abbreviation, it has various ſignifications: thus, D. ſtands for doctor, as M. D. doctor of medicine; D. T. doctor of theology; D. D. implies doctor of divinity, or dono dedit; D. D. D. is uſed for dat, dicat, dedicat; and D. D. D. D. for dignum, Deo, donum, dedit.

DABAS, the name of cloths and woollen ſtuffs of the manufacture of Bas, in Languedoc.

DABUIS, a white cotton ſtuff, made in the Eaſt-Indies.

DACE, the Engliſh name of a ſpecies of cyprinus, very common in our rivers: it is longer and more ſlender than the roach, and has ten rays in the fin beſides the anus.

DACTYL, δακτυλος, *Dactylus*, in ancient poetry, a metrical foot, conſiſting of one long and two ſhort ſyllables, as αλκιμος, and mūrmŭrĕ.

The dactyl and ſpondee are the only feet or meaſures uſed in hexameter verſes; the former being eſteemed more ſprightly, and the latter more ſolemn and grave. Accordingly, where great activity is ſignified, we find the dactyls uſed with much propriety, as in the following verſes of Virgil.

Quadrupedante putrem ſonitu quatit ungula campum; and
Ferte citi ferrum, date tela, ſcandite muros.

DAF

DACTYLIC VERSES, in ancient poetry, hexameter verſes ending with a dactyl. See DACTYL and HEXAMETER.

DACTYLIS, in botany, a genus of plants, whoſe corolla is an acute, oblong, compreſſed glume, and contains three capillary filaments, topped with forked antheræ. It hath no pericarpium; but the ſeed, which is ſolitary, naked, depreſſed on one ſide, and convex on the other, is included in the corolla.

DACZAJIE, ſilver money current in Perſia, and worth five mamoudis. See the article MAMOUDI.

DADO, in architecture, the ſame with the dye. See the article DYE.

DÆMON, Δαιμων, a name given by the ancients to certain ſpirits, or genii, which appeared to men, either to do them ſervice, or to hurt them. The Platoniſts diſtinguiſh between gods, dæmons, and heroes. The gods are thoſe whom Cicero call *Dii majorum gentium*. The dæmons are thoſe whom we call angels. See ANGEL.

DÆMONIAC, a word applied to a perſon ſuppoſed to be poſſeſſed with an evil ſpirit, or dæmon.

DÆMONIACS, in church hiſtory, a branch of the Anabaptiſts, whoſe diſtinguiſhing tenet is, that the devils ſhall be ſaved at the end of the world.

DAFFODIL, in botany. See the article NARCISSUS.

DAFFODIL-LILLY. See the article AMARYLLIS and PANCRATIUM.

See

Sea-DAFFODIL. See PANCRATIUM.

DAILY, the same with diurnal. See the article DIURNAL.

DAIRY, among farmers, &c. a room or apartment where milk is kept, and manufactured into butter, cheese, &c.

The term is formed from *dey*, an old word for milk.

DAISY, *Bellis*, in botany, a genus of plants producing compound, radiated flowers. The florets which compose the disk are hermaphrodite, and those which form the rays are female. The seeds are solitary, ovated, compressed, and contained in the calyx.

From the common wild daisy are produced several varieties with double flowers and different colours, which make a pretty appearance in gardens, and are very easily propagated by parting their roots in autumn.

The leaves of the common daisy are reckoned vulnerary and diuretic.

DALECHAMPIA, in botany, a plant which grows naturally in Jamaica. Its root is composed of many fibres, from which arise several weak twining stalks, which fasten themselves to the neighbouring plants: these are furnished at each joint with a trifoliate leaf. The flowers are produced from the side of the stalk, three or four growing upon a foot-stalk: some of these are male and others female; they are small, and of an herbaceous colour. They have each a double involucrum, made up of two orders of leaves, which are narrow and armed with small, bristly, stinging hairs. The flowers are succeeded by a roundish, three-cornered capsule with three cells, each containing a roundish seed.

DAM, among lawyers, signifies a boundary or confinement.

DAM, or DYKE. See the article DYKE.

DAMA, the fallow-deer, in zoology, a species of the deer-kind, distinguished by its ramose and compressed, or palmated horns.

DAMAGE, in law, in generally understood of a hurt, or hindrance attending a person's estate: but, in common law, it is a part of what the jurors are to enquire of in giving verdict for the plaintiff or defendant, in a civil action, whether real or personal; for after giving verdict on the principal cause, they are likewise asked their consciences, touching costs and damages, which contain the hindrances that one party hath suffered from the wrong done him by the other. See the article COSTS.

DAMARAS, an Indian taffeta, being a kind of armoisin. See ARMOISIN.

DAMASK, a silk stuff, with a raised pattern, so as the right side of the damask is that which hath the flowers raised or sattined.

DAMASK is also applied to a very fine steel, in some parts of the Levant, chiefly at Damascus in Syria; whence its name.

It is used for sword and cutlass-blades, and is finely tempered. See STEEL.

DAMASKEENING, or DAMASKING, the art or operation of beautifying iron, steel, &c. by making incisions therein, and filling them up with gold and silver wire; chiefly used for adorning sword-blades, guards and gripes, locks of pistols, &c.

DAMELOPRE, a kind of bilander, used in Holland for conveying merchandise from one canal to another; being very commodious for passing under the bridges.

DAMIANISTS, in church history, a branch of the ancient Acephali sevejitæ. They agreed with the catholics in admitting the IVth council, but disowned any distinctions of persons in the Godhead, and professed one single nature, incapable of any difference; and yet they called God, the Father, Son, and Holy Ghost.

DAMPS, in natural history, noxious steams and exhalations, frequently found in mines, pits, wells, and other subterraneous places.

DAMSON-TREE. See the article PRUMUS.

DAMNATA TERRA, among chemists, the same with caput mortuum. See the article CAPUT.

DANCE, an agreeable motion of the body, adjusted by art to the measures or tune of instruments, or of the voice.

DANCETTE, in heraldry, is when the outline of any bordure, or ordinary, is indented very largely, the largeness of the indentures being the only thing that distinguishes it from indented. See the article INDENTED.

DANCHE, in heraldry, the same with dentelle, according to Guillim: but Columbier makes it the same with indented.

DANDELION, *leontodon*, in botany, a plant whose flowers are compound and imbricated. The florets are monopetalous and ligulated, and contain five short capillary stamina. The seed, which is solitary and oblong, is contained in the cup of each of the corollæ, and topped with down.

This plant grows naturally in fields; and is a very troublesome weed in gardens.

In medicine, it is accounted an aperient and hepatic: and Boerhaave is of opinion, that when it is used for a considerable time, it will dissolve almost all kinds of coagulations, and open the most obstinate obstructions of the viscera.

When this plant is young, it is by many people eaten as a sallad, and particularly among the French.

DANEGELT, a tax, or tribute, on every hide of land, imposed on our ancestors the Saxons by the Danes, on their frequent invasions, as the arbi-

trary

trary terms of peace and departure. It was first imposed as a continual yearly tax upon the whole nation, under king Ethelred. It was levied by William I. and II. but was released by king Henry the First; and finally abolished by king Stephen.

DANK, a piece of silver current in Persia, and some parts of Arabia, weighing the sixteenth part of a drachm. It is also a weight used by the Arabians to weigh jewels and drugs.

DANTELLE, in heraldry, the same with dancette.

DAPHNE, in botany, a genus of plants, the flower of which consists of a single petal; the tube is cylindric, imperforated, and longer than the limb, which is divided into four oval, acute, plane, patent segments: the fruit is a roundish berry, containing one cell; the seed is single, round, and fleshy.

DAPIFER, the dignity or office of grand-master of a prince's household. This title was given by the emperor of Constantinople to the czar of Russia, as a testimony of favour. In France the like office was instituted by Charlemaign, under the title of dapiferat; and the dignity of dapifer is still subsisting in Germany, the elector of Bavaria assuming the title of arch-dapifer of the empire, whose office is, at the coronation of the emperor, to carry the first dish of meat to table, on horse-back.

DAPPLE BAY, in the manege; when bay horses have marks of a dark bay, they are called dapple-bays.

DAPPLE-BLACK, when a black horse has got spots or marks more black or shining than the rest of his skin, he is called a dapple black.

DARAPTI, among logicians, one of the modes of syllogisms of the third figure, whose premises are universal affirmatives, and the conclusion is a particular affirmative: thus,

DAR- Every body is divisible;
AP- Every body is a substance;
TI. Therefore, some substance is divisible.

DARII, in logic, one of the modes of syllogisms of the first figure, wherein the major proposition is an universal affirmative, and the minor and conclusion particular affirmatives: thus,

DA- Every thing that is moved, is moved by another.
RI- Some body is moved:
I. Therefore, some body is moved by another.

DARNEL, the English name of the lolium of botanists. See the article LOLIUM.

DART, in astronomy, geometry, &c. See the article SAGITTA.

DATA, among mathematicians, a term for such things or quantities as are given or known, in order to find other things thereby that are unknown. Euclid uses the word data, of which he hath a particular tract, for such spaces, lines, and angles, as are given in magnitude, or to which we can assign others equal.

In algebra the given quantities, or data, are generally expressed by the first letters of the alphabet, and the unknown by the last letters; thus, if the problem be, From the sum and product of two quantities given, to find the quantities themselves, the quantities are represented by y and z; and $y + z = a$, the sum given, and $yz = b$, the product given. See the article EQUATION.

DATA also expresses, in philosophy and medicine, any quantity, which for the sake of a present calculation is taken for granted to be such, without requiring an immediate proof for its certainty, called also the given quantity, number, or power.

DATE, in law, is the description of the day, month, year of our Lord, and year of the reign of the king, in which a deed or other writing was made. Anciently deeds had no dates but only of the month and year, and now, if in the date of any deed, the year of our Lord is right, though the year of the king's reign be wrong, it shall not hurt the same.

An antedate is a date prior to the real time when the instrument was passed.

DATE, the fruit of the phœnix, or great palm-tree. See PHŒNIX.

DATISI, in logic, a mode of syllogisms in the third figure, wherein the major is an universal affirmative, and the minor and conclusion particularly affirmative propositions. For example,

DA- All who serve God are kings;
TI- Some who serve God are poor;
SI. Therefore some who are poor are kings.

DATIVE, among grammarians, the third case in the declension of nouns, expressing the relation of a thing to whose profit or loss some other thing is referred. It is called dative, because usually governed by a verb, implying something to be given to some person. In English, the dative is expressed by the signs *to* or *for*.

DATURA, thorn-apple, in botany, a genus of plants whose flower is monopetalous and funnel-shaped, with five subulated filaments, topped with oblong compressed antheræ. The fruit is an oval, bilocular, prickly capsule; and contains a number of kidney-shaped seeds. The common thorn-apple is annual, and grows to the height of two feet. The leaves are large, angular pointed, and of a deep colour, with a very offensive fœtid smell.

It flowers in July and August: and is a poisonous plant; taken inwardly, it causes vomiting, madness, convulsions, which are succeeded by death, if immediate help is wanting.

This genus is the same with the stramonium of Tournefort.

DAUCUS, carrot, in botany. See the article CARROT.

DAVIDISTS, in church history, a sect of Christian heretics in the sixteenth century; so called from David George, their leader, who began by giving out that he was the Messiah, and was sent into the world in order to people the kingdom of Heaven, which was quite empty of inhabitants, for want of virtuous and good men: he rejected marriage, and denied the resurrection.

DAVIS's QUADRANT. See QUADRANT.

DAVIT, in naval affairs, a long beam of wood thrust out across from over the ship's fore-castle to draw up the flooks of the anchor clear from the ship's side.

The davit is occasionally shifted to project over either side of the ship's fore-part, or, in the sea-language, over either bow. Its inner end is secured by a strong ring or link of iron, placed in the middle of the fore-castle, called the span-shackle; and over the outer-end, which has a notch cut round it for that purpose, is hung a strong block called the fish-block, through which is inserted a rope called the fish-pendant, which being hooked to the flooks of the anchor, immediately draws them up by a tackle or complication of pullies, as soon as the anchor is catted. See the article CAT.

DAUPHIN, a title given to the eldest son of France, and heir presumptive of the crown, on account of the province of Dauphiny, which, in 1343, was given to Philip of Valois, on this condition, by Humbert, dauphin of the Viennois.

DAY, according to the most natural and obvious sense of the word, signifies that space of time during which it continues to be light; in contradistinction to night, being that partition of time wherein it is dark; but the space of time in which it is light, being somewhat vague and indeterminate, the time between the rising and the setting of the sun is usually looked on as the day; and the time which lapses from its setting to its rising again, the night.

The word day is often taken in a large sense, so as to include the night also; or to denote the time of a whole apparent revolution of the sun round the earth, in which sense it is called by some a natural day, and by others an artificial one: but to avoid confusion, it is usual to call it in the former sense simply the day, and in the latter a nychthemeron, by which term that acceptation of it is aptly denoted, as it implies both day and night.

The nychthemeron is divided into twenty-four parts, called hours, which are of two sorts, equal and unequal, or temporary. See the article HOUR.

Different nations begin their day at a different hour: thus the Egyptians began their day at midnight, from whom Hippocrates introduced that way of reckoning into astronomy, and Copernicus and others have followed him: but the greatest part of astronomers reckon the day to begin at noon, and so count twenty-four hours, till the noon of the next day; and not twice twelve, according to the vulgar computation. The method of beginning the day at midnight prevails also in Great-Britain, France, Spain, and most parts of Europe.

The Babylonians began their day at sun-rising, reckoning the hour immediately before its rising again the twenty-fourth hour of the day, from whence the hours reckoned in this way are called the Babylonic. In several parts of Germany, they begin their day at sun-setting, and reckon on till it sets next day, calling that the twenty-fourth hour: these are generally termed Italian hours. The Jews also began their nychthemeron at sun-setting; but then they divided it into twice twelve hours, as we do, reckoning twelve for the day, be it long or short, and twelve for the night; so that their hours continually varying with the day and night, the hours of the day were longer than that of the night, for one half year, and the contrary the other, from whence their hours are called temporary: those at the time of the equinoxes became equal, because then those of the day and night are so. The Romans also reckoned their hours after this manner, as do the Turks at this day.

This kind of hours are called planetary, because the seven planets were anciently looked upon as presiding over the affairs of the world, and to take it by turns each of these hours, according to the following order: Saturn first, then Jupiter, Mars, the sun, Venus, Mercury, and last of all the moon: hence they denominated each day of the week from that planet whose turn it was to preside the first hour of the nychthemeron. Thus assigning the first hour of Saturday to Saturn, the second will fall to Jupiter, the third to Mars, and so the twenty-second of the same nychthemeron will fall to Saturn again, and therefore the twenty-third to Jupiter, and the last to Mars: so that on the first hour of the next day, it will fall to the sun to preside; and by the like manner of reckoning, the first hour of the next will fall to the moon; of the next, to Mars; of the next, to Mercury; of the next, to Venus: hence the days of the week came to be distinguished by the Latin names of *Dies Saturni*, *Solis*, *Lunæ*, *Martis*, *Mercurii*, *Jovis*, and *Veneris*; and among us, by the names of Saturday, Sunday, Monday, &c.

DAY-LILLY, in botany. See the article HEMEROCALLIS.

DAYS *of Grace*, are those granted by the court at the prayer of the defendent, or plaintiff, in whose delay it is.

DAYS *of Grace*, in commerce, are a customary number of days allowed for the payment of a bill of exchange, &c. after the same becomes due.

Three days of grace are allowed in England; ten in France and Dantzic; eight at Naples; six at Venice, Amsterdam, Rotterdam, and Antwerp; four

four at Frankfort; five at Leipsic; twelve at Hamburgh; six in Portugal; fourteen in Spain; thirty in Genoa, &c.

DAYS MAN, in the north of England, an arbitrator or person chosen to determine an affair in dispute.

Dog-DAYS, *Dies Caniculares* See the article CANICULAR *Days*.

Intercalary DAYS. See the article INTERCALARY *Days*.

DAY COAL, among miners, an appellation given to the upper stratum of the coal, or that which lies next the surface of the earth.

DEACON, διακονος, one of the three sacred orders of the Christian church. The word is sometimes used in the New Testament for any one that ministers in the service of God, in which sense bishops and presbyters are stiled deacons; but in its restrained sense, it is taken for the third order of the clergy, as appears from the concurrent testimony of ancient writers, who constantly stile them ministers of the mysteries of Christ, ministers of episcopacy and the church, and the like. The first institution of this order is recorded in Acts, chap. vi.

DEACONESS, *a Female Deacon*, an order of women, who had their distinct offices and services in the primitive church.

DEAD, in general, something void or deprived of life. See DEATH.

DEAD-EYES, in naval affairs, certain blocks with three holes in them, whereby to draw tight the shrouds and stays of a ship.

In order to form the purchase which tightens the shrouds, &c. there are always two of these dead-eyes placed at small distances from each other, one in the end of the shroud, and the other to the ship's side, by a strop or link of iron encompassing the edge of it; then a smaller rope, called the laniard, is passed alternately through the holes in the upper and lower dead-eyes, and drawn tight by the application of a tackle. See CHANNEL and CHAINS.

The dead-eyes used for the stays have only one hole in them, and are more usually termed hearts.

There are likewise dead-eyes of another form used for the crow-feet: these are long, inclining to round, and tapering to one end. See CROW-FEET.

DEAD-LIGHT, amongst seamen, a sort of strong wooden posts, made exactly to fit the cabin-windows: they are always fixed in on any expectation of a storm, and the glass windows taken out, which might otherwise be shattered to pieces by the sea, and let great quantities of water pour into the ship.

DEAD-NETTLE, the English name for the lamium of botanists. See LAMIUM.

DEAD-RECKONING, in navigation, the judgment or estimation which is made of the place where a ship is, without any observation of the heavenly bodies; and is performed by keeping an account of her way by the log, in knowing the course they have steered by the compass, and by rectifying all the allowances for drift, lee-way, &c. according to the ship's known trim. This reckoning, however, is always to be corrected as often as any good observation can be obtained.

DEAD-RISING, or RISING-FLOOR, in ship-building, those parts of a ship's floor afore and abaft, where it begins to rise and grow narrower as it approaches the stem and stern-post.

DEAD-TOPS, a disease incident to young trees, cured by cutting off the dead parts close to the next good twig or shoot, and claying them over, as in grafting. See the article GRAFTING.

DEAD-WATER, in the sea language, the eddy of water which closes in with a ship's stern, as she sails through it.

DEADLY-CARROT, a plant called by botanists thapsia. See the article THAPSIA.

DEADLY-NIGHTSHADE, in botany. See the article ATROPA.

DEAFFORESTED, a term found in law-books, signifying that a place is discharged from being a forest, or freed from the forest-laws.

DEAFNESS, the state of a person who either wants the sense of hearing, or has it greatly impaired.

With regard to the cure, if the obstruction be in the external cavity of the ear, it is discernible by the sight. If there is occasion to syringe the ear, a decoction of sage and rosemary-flowers will be proper, with equal parts of water and white-wine: but great caution should be used.

Hoffman says, deafness sometimes arises from a slackness of the auditory nerves, which often happens from too great a humidity, which, if neglected, will terminate in a perpetual and incurable deafness, and may be dispersed, if taken in time, by proper cephalics and sudorifics.

Heister informs us, that medicinal waters drank in the summer-time pretty largely, are the best means as preservatives, and for curing disorders of the ears; and that they often perform more than any other remedies whatever.

DEAL, a thin kind of fir-planks, of great use in carpentry: they are formed by sawing the trunk of a tree into a great many longitudinal divisions, of more or less thickness, according to the purposes they are intended to serve.

Deals are rendered much harder, by throwing them into salt-water as soon as they are sawed, keeping them there three or four days, and afterwards drying them in the air or sun; but neither this, nor any other method yet known, will preserve them from shrinking.

DEAN, an ecclesiastical dignity in cathedral and collegiate churches, and head of the chapter.

Rural DEAN, called also archpresbyter, originally exercised jurisdiction over ten churches in the country, and afterwards became only the bishop's

ſubſtitute, to grant letters of adminiſtration, probate of wills, &c. to convocate the clergy, and ſignify to them ſometimes by letters, the biſhop's will, and to give induction for the archdeacon. Their office is now loſt in that of the archdeacons and chancellors.

DEAN *of a Monaſtery*, was a ſuperior eſtabliſhed under the abbot, to eaſe him in taking care of ten monks; whence he was called decanus.

DEAN *and* CHAPTER, are the biſhop's council to aſſiſt him in the affairs of religion, and to aſſent to every grant which the biſhop ſhall make to bind his ſucceſſors. As a deanery is a ſpiritual dignity, a man cannot be a dean and prebendary of the ſame church.

DEARTICULATION, the ſame with diarthroſis. See the article DIARTHROSIS.

DEATH, *Mors*, is generally conſidered as the ſeparation of the ſoul from the body; in which ſenſe it ſtands oppoſed to life, which conſiſts in the union thereof.

DEATH-WATCH, in zoology, an inſect nearly of the ſize of the common louſe, frequent among old wood, furniture, &c. It is of an oblong and flattiſh figure, and of a pale browniſh white colour; and the noiſe, reſembling the beating of a watch, is the love note of theſe animals, when the male or female woo each other.

DE BENE ESSE, a Latin phraſe uſed in our law in a doubtful meaning, as to take or do a thing *de bene eſſe*, is to allow it at preſent to be well done; but when it comes to be more fully examined, then to ſtand or fall, according to the merit of the thing.

DEBENTURE, a term of trade uſed at the cuſtom-houſe for a kind of certificate ſigned by the officers of the cuſtoms, which intitles a merchant exporting goods to the receipt of a bounty or drawback.

DEBENTURE, in ſome of the acts of parliament, denotes a kind of bond or bill firſt given in 1649, whereby the government is charged to pay the ſoldier creditor, or his aſſigns, the money due on auditing the account of his arrears.

DEBENTURE is likewiſe uſed in the exchequer, and given to the king's ſervants for the payment of their wages.

DEBET, among merchants, ſignifies the ſums due to them for goods ſold on credit, for which they have charged their journal or ledger. It is more particularly underſtood of the remainder of debts, part of which has been paid on account.

DEBET, among book-keepers, is uſed to expreſs the left-hand page of the ledger, to which are carried all articles ſupplied or paid on the ſubject of an account.

DEBILITY, among phyſicians, a relaxation of the ſolids, occaſioning oftentimes weakneſſes and faintings.

DEBRUIZED, in heraldry, a term peculiar to the Engliſh, by which is intimated the grievous reſtraint of any animal, debarred of its natural freedom, by any of the ordinaries being laid over it.

DEBT, *Debitum*, in law, any thing due to another, whether it be money, goods, or ſervices; or the action brought for recovering the ſame.

DEBTOR, a perſon who owes any thing to another, in contradiſtinction to creditor, which is he to whom the debt is owing.

DEBTOR, in merchant's accounts. See BOOK-KEEPING.

DECACHORDON, in antiquity, a muſical inſtrument with ten ſtrings, called by the Hebrews, haſur, being almoſt the ſame as our harp, of a triangular figure, with an hollow belly, and ſounding from the lower part.

DECAGYNIA, the name of an order, or ſubdiviſion in the Linnæan ſyſtem of botany, and comprehends ſuch flowers as have ten piſtils or ſtyles in each.

DECAGON, a plane figure in geometry, having ten ſides and ten angles; and if all the ſides are equal, and all the angles, it is called a regular decagon, and may be inſcribed in a circle.

The word is formed from the Greek, δεκα, ten, and γωνια, an angle.

The ſides of a regular decagon are, in power and length, equal to the greateſt ſegment of an hexagon inſcribed in the ſame circle, and cut in extreme and mean proportion.

DECALOGUE, the ten precepts or commandments delivered by God to Moſes, after engraving them on two tables of ſtone.

The word is Greek, δεκαλογος, and compounded of δεκα, ten, and λογος, a word.

The Jews, by way of excellence, call theſe commandments the ten words, from whence they had afterwards the name of decalogue.

DECAMPING, in military affairs, is the marching of an army from the ground where it before lay encamped. See CAMP.

DECANDRIA, the name of the tenth claſs in the Linnæan ſyſtem of botany; its characteriſtic is, that it conſiſts of ſuch plants as bear hermaphrodite flowers, furniſhed with ten ſtamina in each.

To this claſs belong ſaxifrage, dittany, arbutus, lychnis, and ſeveral others.

DECANTATION, among chemiſts, &c. the gently pouring off a liquor from its fæces, by inclining the lip, or canthus of the veſſel; whence the name.

DECANUS, in Roman antiquity, an officer who preſided over ten other officers, and was head of the contubernium, or ſerjeant of a file of ſoldiers.

DECAPITE, or DEFAIT, in heraldry. See the article DEFAIT.

DE-

DECASTYLE, in the ancient architecture, a building with an ordonance of ten columns in front, as the temple of Jupiter Olympius was.

DECEIT, *Dolus*, in law, a subtle trick, or device, to which may be added all manner of craft and colluſion, or underhand practice, uſed to defraud another, by any means whatever.

DECEMBER, in chronology, the laſt month of the year, conſiſting of thirty-one days, and ſo called, as being the tenth month in the Roman year, which commenced with March. See the articles YEAR and MONTH.

DECEMVIRI, in Roman antiquity, ten magiſtrates choſen annually at Rome, to govern the commonwealth inſtead of conſuls, with an abſolute power to draw up and make laws for the people.

There were alſo other decemviri, created on frequent emergencies, to manage and regulate certain affairs, as conducting colonies, preſiding at feaſts, taking care of ſacrifices, keeping the ſybils books, &c.

DECENNALIA, ancient Roman feſtivals celebrated by the emperors, every tenth year of their reign, with ſacrifices, games, and largeſſes for the people.

DECENNIERS, DECINERS, or DOZINERS, in our ancient law, ſuch as had the overſight of ten friburghs, for the maintenance of the king's peace, the limits of whoſe juriſdiction was called decenna.

DECIDUOUS, an appellation chiefly uſed in reſpect to plants: thus, the calyx or cup of a flower is ſaid to be deciduous, when it falls along with the flower-petals; and, on the contrary, it is called permanent, when it remains after they are fallen. Again, deciduous leaves are thoſe which fall in autumn, in contradiſtinction to thoſe of ever-greens, which remain all the winter.

DECIL, in aſtronomy, an aſpect or poſition of two planets, when they are diſtant from each other a tenth part of the zodiac.

DECIMAL ARITHMETIC, the art of computing by decimal fractions, firſt invented by Johannes Regiomontanus, and uſed by him in the conſtruction of his tables of ſines.

DECIMAL FRACTIONS are thoſe whoſe denominator is 1, with one or more cyphers; as, 10, 100, 1000, 10000, &c. Thus, $\frac{5}{10}$, $\frac{6}{100}$, $\frac{7}{1000}$, &c. are decimal fractions.

DECIMATION, a puniſhment inflicted by the Romans on ſuch ſoldiers as quitted their poſt, or behaved themſelves cowardly in the field. The names of all the guilty were put into an urn or helmet, and as many were drawn out as made the tenth part of the whole number, and theſe were put to the ſword, and the others ſaved.

DECIPHERING, the art of finding the alphabet of a cipher. See CIPHER.

DECKS, in ſhip-building, the planked floors on which the guns reſt and the men walk: they are ſupported by the beams, and by two rows of ſmall pillars called ſtanchions, ſituated at proper diſtances from each other for the whole length of the ſhip. Firſt and ſecond rate ſhips, and the largeſt order of the third rate, are furniſhed with three decks, diſtinguiſhed by the names of the upper, middle, and lower-decks, the laſt of which is however commonly termed, abſurdly enough, the gun-deck: beſides theſe three, there is the quarter-deck and forecaſtle, which are on the ſame line, but are at ſome diſtance from each other, leaving a vacancy in the middle, which is called the waiſt. Above the hinder or aftmoſt part of the quarter-deck there is yet another deck, called the poop, which extends nearly over half of the quarter-deck, and forms a roof for the captain's cabbin, which is called the coach.

Fluſh-DECK, or a DECK *fluſh fore and aft*, is one laid from ſtem to ſtern, with one floor, without any heights or hollows, only the gradual riſing of the floor from the middle towards the two ends.

DECLAMATION, a ſpeech made in public, in the tone and manner of an oration, uniting the expreſſion of action to the propriety of pronunciation, in order to give the ſentiment its full impreſſion upon the mind.

DECLARATION, in law, is a formal ſhewing in writing the ground of complaint of the plaintiff, in an action againſt the defendant, where the plaintiff is ſuppoſed to have received ſome injury.

DECLENSION, in grammar, an inflexion of nouns, according to their divers caſes, as nominative, genitive, dative, &c. It is a different thing in the modern languages, which have not properly any caſes, from what it is in the ancient Greek and Latin.

DECLINATION, in aſtronomy, is the diſtance of any celeſtial object, or point in the heavens, from the celeſtial equinoctial, either north or ſouth, in degrees, minutes, &c. meaſured on a meridian, or circle of declination.

The greateſt declination of the ſun, or of the ecliptic, was firſt, as we know of, obſerved by Pytheas, at Maſtilia, about 324 years before Chriſt; who, obſerving that the height of a gnomon was to its ſhadow, when the ſun was in the meridian, as 31951$\frac{1}{2}$ to 90000, from thence concluded the ſun's greateſt declination to be 23 deg. 52 min. 41 ſec. And Gaſſendus found the ſolſtitial ſhadow of the ſame length as it had been obſerved by Pytheas, near 2000 years before: and ſo he concluded that the ſun's greateſt declination is conſtant. But from a compariſon of the ſeveral obſervations concerning this matter, the ſun's greateſt declination is commonly accounted 23 deg. 30 min.

DECLINATION *of the Sea-Compaſs*, or *Needle*, is its variation from the true meridian of any place.

DECLINATION *of a Wall*, or *Plane of Dials*, is an arch of the horizon, contained either between the plane and the prime vertical circle, if you reckon it from the eaſt or weſt; or elſe between the meridian and the plane, if you account it from the north or ſouth.

DECLINATORIES, are inſtruments for taking the declinations, inclinations, and reclinations of planes; and they are of ſeveral kinds.

The beſt ſort for taking the declination conſiſts of a ſquare piece of braſs, or wood, with a limb accurately divided into degrees, and every fifth minute, if poſſible, having a horizontal dial moving on the center, made for the latitude of the place it is to ſerve in, and which has a ſmall bit of fine braſs fixed on its meridian line, like a fiducial edge, to cut the degrees of the limb; for at any time when the ſun ſhines, by having the hour of the day, you may find the declination of any wall or plane by this inſtrument.

DECLINING DIALS, are thoſe whoſe planes ſtand perpendicularly to the horizon, and decline; that is, do not face directly the four cardinal points. See the article DIAL.

DECLIVIS, in anatomy, a muſcle otherwiſe called obliquus deſcendens. See the article OBLIQUUS.

DECLIVITY, denotes juſt the reverſe of acclivity. See ACCLIVITY.

DECOCTION, in pharmacy, the boiling ſimples, or other drugs, in order to extract their virtues for ſome medicinal purpoſe.

DECOMPOSITE LEAF, one whoſe petiole is twice divided before it gives riſe to the leaf.

DECOMPOSITION, in chemiſtry and pharmacy, the reduction of a body into its principles or component parts. See the article ANALYSIS.

DECORATION, in architecture, is uſed for whatever adorns a building, either without-ſide, or within. The orders of architecture contribute a great deal to the decoration; but then the ſeveral parts of theſe orders muſt have their juſt proportion, characters, and ornaments, otherwiſe the fineſt order will bring confuſion rather than richneſs.

DECORTICATION, the ſame with barking of trees. See BARKING.

DECORUM, in architecture, is the ſuitableneſs of a building, and the ſeveral parts and ornaments thereof, to the ſtation and occaſion.

DECOUPLE, in heraldry, the ſame as uncoupled: thus, a chevron decouple, is a chevron wanting ſo much of it towards the point, that the two ends ſtand at a diſtance from one another, being parted and uncoupled.

DECOY. In a naval chace, it is uſual for ſmall ſhips of war to diſfigure themſelves in ſuch a manner by painting, as to be miſtaken for merchantmen, or ſhips of the enemy, in order to deceive and provoke the adverſary to chaſe, at which time they are careful, by altering the trim of the ſhip, which is eaſily done, to prevent her from ſailing faſt, although at the ſame time they have a great ſail abroad, and appear extremely anxious to eſcape.

DECOY, a place made for catching wild fowl. Hence,

DECOY-DUCK is a duck that flies abroad, and lights into company of wild ones, which by her allurements ſhe draws into the decoy.

DECREE, an order made by a ſuperior power for the regulation of an inferior.

DECREE, in the civil law, is a determination that the emperor pronounces upon hearing a particular cauſe between the plaintiff and defendant.

DECREES *of Councils*, are the laws made by them, to regulate the doctrine and policy of the church.

DECREES *in Chancery*, are the determinations of the lord-chancellor, upon a full hearing of the merits of a cauſe.

DECREET, in the law of Scotland, a final decree or judgment of the lords of ſeſſion, from which an appeal only lies to parliament.

DECREMENT, in heraldry, ſignifies the wane of the moon from the full to the new.

DECREPITATION, in chemiſtry, the act of calcining ſalt over the fire, till it ceaſes to crackle. The deſign of this is to free the ſalt from ſuperfluous moiſture: but as it is thereby rendered porous, and apt to imbibe the humidity of the air, it muſt always be kept very cloſe afterwards, leſt the air ſhould moiſten it a-new.

DECREPITATION is alſo applied to the crackling of the ſalts during the operation.

DECRETAL, in the canon-law, a letter of a pope, determining ſome point or queſtion in the eccleſiaſtical law. The decretals compoſe the ſecond part of the canon-law.

DECUPLE PROPORTION, that of ten to one. See the article PROPORTION.

DECURIO, in Roman antiquity, a commander of ten men in the army, or the chief of a decury.

DECURRENT LEAF, one which adheres immediately to the ſtalk of a plant, without any pedicle, and which has its lower part extended, and running a little way along the branch.

DECURY, ten perſons ranged under one chief, or leader, called the decurio.

DECUSSATION, a term in geometry, optics, and anatomy, ſignifying the croſſing of any two lines, rays, or nerves, when they meet in a point, and then go on ſeparately from one another.

DECUSSORIUM, a ſurgeon's inſtrument, which, by preſſing gently on the dura matter, cauſes

causes an evacuation of the pus collected between the cranium and the before-mentioned membrane, through the perforation made by the trepan.

DEDICATION, a solemn devoting, or setting apart, any person or thing, to the service of God, and the purposes of religion.

DEDICATION, in matters of literature, the inscribing a book, poem, play, or the like, to some person of distinction, serving both as a protection and honour to them, and a mark of the author's respect for the person to whom he dedicates his work.

DEDUCTION, in commerce, a subtracting or retrenching a little sum paid, from a greater remaining yet unpaid.

DEDUCTIONE, in music, a name given to the rising of the voice, in pronouncing the syllables *ut, re, mi, fa, sol, la*; *quia per has deducitur vox*; in contradistinction to reductio, when the voice descends by these, *la, sol, fa, mi, re, ut*; *quia per has reducitur vox.*

DEED, an instrument written on paper or parchment, comprehending some contract, bargain, or agreement, between the parties thereto, in relation to the matter therein contained.

DEER, *Cervus*, in zoology. See the article CERVUS.

DEER-HAYS, large nets, made of cords, to catch deer. Whoever keeps them, except in his own park, forfeits forty shillings a month.

DEER-STEALERS are punishable by various laws and statutes, made from time to time. Any offender convicted of deer-stealing, before a judge of goal delivery, may be transported by 5 Geo. I. cap. xxviii. And it is felony for persons to appear armed and disguised in a forest or park, and hunt or kill the deer, by 6 Geo. I. cap. xxii.

DE FACTO, something actually in fact, or existing, in contradistinction to de jure, where a thing is only so in justice, but not in fact: as a king de facto is a person that is in actual possession of a crown, but has no legal right to the same; and a king de jure is the person who has a just right to the crown, though he is out of possession thereof.

DEFAMATION, the speaking slanderous words of another; for which the slanderer is punishable, according to the nature of his offence, either by action upon the case at common law, or by statute, or in the ecclesiastical court. No damages are given in the ecclesiastical court, but the punishment of the party is by way of penance.

DEFAULT, in law, is generally taken for non-appearance in court, at a day assigned; but imports any omission of that which we ought to do, for which judgment may be given against the defaulter. In the usual sense, if the plaintiff in a suit make default in appearance on a trial, he will be non-suited; and where a defendant makes default, judgment should be had against him by default. Jurors making default in their appearance, are to lose and forfeit issues.

DEFECTIVE, in general, an appellation given to things which want some of the properties that naturally they ought to have. Thus,

DEFECTIVE NOUNS are those which want one of the numbers, or one or more cases. See the article NOUN.

DEFECTIVE THIRD, among musicians, the same with diminished third. See the article DIMINISHED.

DEFEISANCE, or DEFEASANCE, in our law, a condition relating to some certain deed, which being performed, the deed is defeated and rendered void, as if it had never been made.

DEFENCE, in fortification, all sorts of work that cover and defend the opposite posts; as flanks, casements, parapets, and fausse-brays.

It is almost impossible to fix the miner to the face of a bastion, till the defences of the opposite one are ruined, that is, till the parapet of its flank is beaten down, and the cannon, in all parts that can fire upon that face which is attacked, are dismounted.

Line of DEFENCE, a supposed line drawn from the angle of the curtain, or from any other part in the curtain, to the flanked angle of the opposite bastion. See the articles CURTAIN and BASTION.

A line of defence represents the flight of a musket-ball from the place where the musketeers stand, to scour the face of the bastion, and ought never to exceed the reach of a musket. It is either sichant or razant; the first is when it is drawn from the angle of the curtain to the flanked angle: the last, when it is drawn from a point in the curtain, razing the face of the bastion.

DEFENCE, in law, signifies a plea, or what the defendant ought to make after the plaintiff's count, or declaration, viz. that he defends all the wrong, force, and damages, where and when he ought, &c.

DEFENCES, in heraldry, are the weapons of any beast, as the horns of a stag, the tusks of a wild boar, &c.

DEFENDANT, in law, the person sued in an action personal; as tenant is he who is sued in an action real. See ACTION.

DEFENDER *of the Faith*, a peculiar title, belonging to the king of Great-Britain, as Catholic does to the king of Spain, Christian to the king of France, &c.

This title was first given by pope Leo X. to king Henry VIII. for writing against Luther.

DEFENSITIVE, in surgery, signifies a bandage, plaster, &c. to defend any part from external injuries.

DEFERENT, in anatomy, a term applied to certain vessels in the body, that serve for the conveyance

veyance of humours from one part to another. See DEFERENTIA VASA.

DEFERENT, in the Ptolemaic aſtronomy, a circle invented to account for the eccentricity, perigee, and apogee of the planets.

DEFERENTIA VASA, two white, ſolid, flatted tubes, one lying on the right ſide, the other on the left, from the epididymis, of which they are continuations: each of them runs up in the cellular vagina of the ſpermatic veſſels, as high as the openings in the abdominal muſcles; the blood veſſels lying forward, and the vas deferens behind them.

Their uſe is to carry the ſemen from the epididymes to the veſiculæ ſeminales; and, in the coitus, to diſcharge it into the urethra.

DEFICIENT, in general, ſignifies much the ſame with defective. See DEFECTIVE.

DEFICIENT HYPERBOLA, one with only one aſymptote, and two hyperbolical legs running out infinitely towards the aſymptote, but contrary ways. See the article HYPERBOLA.

DEFICIENT INTERVAL, in muſic, one leſs by a comma than it ought to be. See COMMA and INTERVAL.

DEFICIENT NUMBERS, thoſe whoſe parts or multiples, added together, fall ſhort of the integer, whereof they are the parts; ſuch is 8, its parts, 1, 2, 4, making only 7. See the article NUMBER.

DEFILE, in fortification, a ſtraight narrow paſſage, through which a company of horſe or foot can paſs only in file, by making a ſmall front; ſo that the enemy may take an opportunity to ſtop their march, and to charge them with ſo much the more advantage, in regard that thoſe in the front and rear cannot reciprocally come to the relief of one another.

To DEFILE, is to reduce an army to a ſmall front, in order to march through a defile.

DEFILING *a Lodgment*. See ENFILADE.

DEFINITE, in grammar, is applied to an article that has a preciſe determinate ſignification; ſuch as the article *the* in Engliſh, *le* and *la* in French, &c. which fix and aſcertain the noun they belong to ſome particular, as *the king*, *le roy*; whereas in the quality *of king*, *de roy*, the articles *of* and *de* mark nothing preciſe, and are therefore indefinite.

DEFINITION, the ſhewing the meaning of one word by ſeveral other not ſynonymous terms.

DEFINITION, in rhetoric, is defined by Cicero, a ſhort comprehenſive explanation of a thing.

DEFLAGRATION, in chemiſtry, the kindling or ſetting fire to a ſalt, mineral, &c. either alone or mixed for that purpoſe, with a ſulphureous one, in order to purify it.

DEFLECTION *of the Rays of Light*, a property which Dr. Hook obſerved in 1675, and read an account of before the Royal Society, March 18, the ſame year. He ſays he found it different both from reflection and refraction, and that it was made towards the ſurface of the opaque body, perpendicularly.

This is the ſame property which Sir Iſaac Newton calls inflection. See the article INFLECTION.

DEFLUXION, in medicine, the falling of humours from a ſuperior to an inferior part of the body. See the articles CATARRH and PHTHISIS.

DEFLUXION *on the Eyes*. See the article EYES.

DEFORCEMENT, in law, the caſting any one out of his land, or with-holding of lands and tenements by force from the right owner.

DEFORMITY, the want of that uniformity neceſſary to conſtitute the beauty of an object.

DEFOSSION, BURYING ALIVE, a puniſhment which the Romans inflicted on ſuch of their veſtals as were guilty of incontinency.

DEFTERDAR, or DEFTARDAR, in the Turkiſh and Perſian polity, an officer of ſtate, anſwering to our lord-treaſurer, who appoints deputies in every province. See TREASURER.

DEGLUTITION, in medicine, the act of ſwallowing the food, performed by means of the tongue driving the aliment into the œſophagus, which, by the contraction of the ſphincter, protrudes the contents downwards.

DEGRADATION, the act of depriving a perſon for ever of a dignity or degree of honour, and taking away the title, badge, and privileges of it.

DEGRADATION, in painting, expreſſes the leſſening the appearance of diſtant objects in a landſcape, in the ſame manner as they would appear to an eye placed at that diſtance from them. See the articles PERSPECTIVE and LANDSCAPE.

DEGRADED CROSS, in heraldry, a croſs divided into ſteps at each end, diminiſhing as they aſcend towards the center, called by the French perronnée.

DEGREE, in geometry, a diviſion of a circle, including a three hundred and ſixtieth part of its circumference.

Every circle is ſuppoſed to be divided into three hundred and ſixty parts, called degrees, and each degree divided into ſixty other parts, called minutes; each of theſe minutes being again divided into ſixty ſeconds, each ſecond into thirds, and each third into fourths, and ſo on. See the articles MINUTE, SECOND, &c.

DEGREE *of Longitude*. See LONGITUDE.

DEGREE *of Latitude*. See the article LATITUDE.

A degree of the meridian on the ſurface of the globe is variouſly determined by various obſervers. Mr. Picart meaſured a degree in the latitude of 49° 21′, and found it equal to 57060 French toiſes. But the French mathematicians, who have lately examined Mr. Picart's operations, aſſure us, that the degree in that latitude is 57183 toiſes. Our countryman, Mr. Norwood, meaſured the diſtance between London and York, and found it 905751

Engliſh feet, or 69 Engliſh miles, 288 yards. Mr. Maupertuis meaſured a degree in Lapland, in the latitude of 66° 20′, and found it 57438 toiſes. A degree was likewiſe meaſured at the equator by other French mathematicians, and found to contain 56767.8 toiſes. Whence it appears, that the earth is not a ſphere, but an oblate ſpheroid. See the articles EARTH, SPHEROID, &c.

DEGREE, in the civil and canon law, denotes an interval in kinſhip, by which proximity and remoteneſs of blood are computed.

DEGREE, in chemiſtry, denotes the ſtate or intenſeneſs of fire. See FIRE.

DEGREES, in muſic, are the little intervals whereof the concords, or harmonical intervals, are compoſed.

DEGREE, in univerſities, denotes a quality conferred on the ſtudents or members thereof, as a teſtimony of their proficiency in the arts or ſciences, and intitling them to certain privileges.

DEHORS, in the military art, all ſorts of outworks placed at ſome diſtance from the walls of a fortification, the better to ſecure the main places, and to protract the ſiege, &c. See CROWN-WORK and HORN-WORK.

DEIFICATION, in antiquity, the ſame with apotheoſis. See APOTHEOSIS.

DEINCLINERS, or DEINCLINING DIALS, are ſuch as both decline and incline, or recline at the ſame time. See the article DIAL.

DEISM, the ſyſtem of religion acknowledged by the deiſts. See the next article.

DEISTS, in the modern ſenſe of the word, are thoſe perſons in Chriſtian countries, who acknowledging all the obligations and duties of natural religion, diſbelieve the Chriſtian ſcheme, or revealed religion. They are ſo called from their belief in God alone, in oppoſition to Chriſtians.

DEITY, a term frequently uſed in a ſynonymous ſenſe with God. See GOD.

DELEGATES, commiſſioners appointed by the king under the great ſeal to hear and determine appeals from the eccleſiaſtical court.

DELETERIOUS, an appellation given to things of a deſtructive or poiſonous nature. See POISON.

DELF denotes a quarry or mine, where either ſtone or coal is dug; but is more particularly uſed for the veins of coal lying under ground, before it is dug up. A delf, or delve of coals, alſo denotes a certain quantity when dug.

DELF, in heraldry, is by ſome ſuppoſed to repreſent a ſquare ſod or turf, and to be ſo called from delving, or digging.

DELIA, in antiquity, feaſts celebrated by the Athenians in honour of Apollo, ſurnamed Delius.

DELIA was alſo a quinquennial feſtival in the iſland of Delos, inſtituted by Theſeus, at his return from Crete, in honour of Venus, whoſe ſtatue, given him by Ariadne, he erected on that place.

DELIAC, or DELIACAL PROBLEM, a problem much celebrated in the writings of the ancients, concerning the duplication of the cube. See the articles DUPLICATION and CUBE.

DELINEATION, or DELINEATING, the ſame with deſigning. See the article DESIGNING.

DELINQUENT, a guilty perſon, or one who has committed ſome fault, or offence, for which he is puniſhable.

DELIQUIUM, in chemiſtry, ſignifies the ſolution of any body, when expoſed to a cool and damp place, by the humidity it attracts from the air. The ſalt of tartar diſſolved in the above manner is called oil of tartar per deliquium.

DELIRIUM, in phyſic, an incapacity in the organs of ſenſation to perform their functions in a proper manner, ſo that the mind does not reflect upon or judge of external objects as uſual.

The word is derived from the Latin, *deliro*, to rave, or talk idly.

This frequently happens in fevers, from too impetuous a motion of the blood, which ſo far alters the ſecretion of the brain, as to diſorder the whole nervous ſyſtem.

DELIVERY, in medicine, the bringing forth a perfect fœtus or child from its mother's womb.

DELPHINUM, lark-ſpur, in botany, a genus of plants whoſe flower conſiſts of five unequal petals, diſpoſed circularly: of theſe the upper one is anteriorly more obtuſe than the others, and is emarginated, and extended behind into a tubulated horn, which is ſtraight, long, and obtuſe. The two ſide petals are nearly of the ſize with the upper; and the two lower are leſs, and ſpread open. The ſtamina are numerous; and the fruit conſiſts of three capſules, of an ovate-ſubulated figure, joined together, which are filled with a number of angulated ſeeds.

There are ſeveral ſpecies of lark-ſpur; but the ſort which is well known, and common in gardens (particularly thoſe with double flowers of various colours) is much in eſteem, and extremely beautiful.

Theſe are annual, and may be ſown in autumn or ſpring. Where the land is light and dry, the autumn ſowing is to be preferred; for if the plants withſtand the ſeverity of winter, they blow much earlier than thoſe ſown in the ſpring, and their ſpikes of flowers are conſiderably larger. In order to continue their plenitude, all plants with ſingle flowers ſhould be deſtroyed ſo ſoon as they appear, reſerving for ſeed thoſe only which are very double.

They flower in July and Auguſt, and are great ornaments to the pleaſure garden.

DELPHINUS or DOLPHIN, in aſtronomy, a conſtellation of the northern hemiſphere, whoſe ſtars, according to Ptolemy and Tycho's catalogue, are 10; but in the Britiſh catalogue 18.

The ſtory concerning the dolphin's having a place in the heavens is various: ſome ſay, that Neptune, the god of the ſea, falling in love with Amphitrite,

he desired to marry her; but she being very modest and shame-faced, hid herself from the sea god, who sent many messengers in search of the beautiful nymph, among whom was the dolphin, who was so fortunate to find her; and by many persuasive arguments, persuaded her to return and match with Neptune, for which piece of service he was placed in heaven.

Others say, that when Bacchus had transformed the mariners that would have betrayed him into dolphins, he placed one of them in heaven, that it might be a warning for others to take heed how they carried any one out of their way, either contrary to his desire, or their own promise.

Other poets again tell us a story of one Arion, a lyric poet of Lesbos, who got great riches by his art, and as he was going to Italy, the mariners attempted to rob him; but he desired he might be permitted to play one tune on his harp before they threw him into the sea, where a dolphin, drawn thither by the sweetness of the music, received him on his back, and carried him to Tenedos with all his money; for which kindness, according to Ovid, he was made a constellation, who expresses himself thus:

The gods beheld the gen'rous deed, and Jove
Advanced him from the deep to shine above
Among the constellations, now divine;
And for his share of stars, he gave him nine.

Novidius referreth this constellation to the fish that saved Jonas from being drowned.

Order.	Magn.	Name.	Bayer. Let.	Right Ascension	Distance from Nor. Pole.	Var. in Right Ascen.	Var. in Declination.
				° ′ ″	° ′ ″	″	″
1	6			304.41.21	79.53.58	41. 2	11. 5
2	3		ε	305.25.37	79.30.17	43.15	11.63
3	6		η	305.38. 1	77.47.28	41. 0	11. 7
4	5		ξ	306. 0.54	76. 9.12	40. 2	11. 8
5	6		ι	306.33.19	79.27.18	41. 2	11. 9
6	3		β	306.34.12	76.14.14	42.23	11.95
7	6		κ	306.50.50	80.45.35	42. 0	10. 0
8	6		θ	306.50.18	77.31.50	41. 0	10. 1
9	3		α	307.13.33	74.57.23	41.87	12.10
10	6			307.29.54	76.15.32	40. 4	12. 1
11	3.4		δ	308. 3.36	75.46.44	42. 9	12. 2
12	3.4		γ	308.52.25	74.43.37	41.91	12.59
13	5			308.57.43	84.51.40	43. 0	12. 6
14	6			309.29.17	83. 1.11	42. 2	12. 7
15	6			309.27.49	78.20.24	41. 0	12. 9
16	6			311. 0.42	78.20.28	41. 2	13. 0
17	6			311. 0.21	77.11. 9	41. 0	13. 1
18	6			311.40.53	80. 4. 4	40. 0	13. 4

DELTOIDES, in anatomy, a thick triangular muscle of the arm, being one of the three elevators. See the article ELEVATOR.

This muscle arises from the clavicle, and the acromion and spine of the scapula; and terminates at four fingers breadth below the neck of the humerus. See the article HUMERUS.

DELUGE, an inundation or overflowing of the earth, either wholly or in part, by water.

We have several deluges recorded in history, as that of Ogyges, which overflowed almost all Attica; and that of Deucalion, which drowned all Thessaly in Greece; but the most terrible was that which is called the universal deluge, or Noah's flood, which overflowed and destroyed the whole earth, and out of which only Noah and those with him in the ark escaped.

DELVIN, among the miners of Cornwall, a kind of slate more usually called killas. See the article KILLAS.

DEMAIN, or DEMESNE, in its common acceptation, is used for the lands round a manor-house, occupied by the lord. See the article MANOR.

DEMAIN, or DEMESNE, in law, is commonly understood to be the lord's chief manor place, with the lands thereto belonging, which he and his ancestors have time out of mind kept in their own manual occupation, for the maintenance of themselves and their families. See the article MANOR.

DEMAIN denotes also all the parts of any manor not in the hands of freeholders.

DEMAND, in law, the calling upon a person for any thing that is due.

There are two kinds of demands, the one in deed, and the other in law. And these are again divided into three sorts; one in writing, without speaking, as in every writ of præcipe; one other without writing, being a verbal demand of the person who is to perform something; and another made without either words or writing, which is termed a demand in law, as in cases of entries on lands, &c. And as an entry upon land and taking distress for rent, are a demand in law of the land and rent, so the bringing an action of debt for money due on a bond, is a demand in law of the debt.

Debt and claims are to be demanded in time by the statute of limitations, or they will be lost by law.

DEMANDANT, in law, is the plaintiff in all real actions, wherein land, &c. is demanded; for these actions are by demands, as personal actions are by plaints.

DEMESNE, the same with demain. See DEMAIN.

DEMI, a word used in composition with other words to signify half. In words borrowed from the Latin we use semi. See the article SEMI.

DEMI-BASTION, a fortification having only one face and one flank. See the article BASTION.

DEMI-CANNON. See the article CANNON.

DEMI-CULVERIN. See also CANNON.

DEMI-

DEMI-GORGE, in fortification, half the gorge, or entrance into the baſtion, not taken directly from angle to angle, where the baſtion joins to the curtin; but from the angle of the flank to the center of the baſtion, or the angle the two curtins would make, where they protracted to meet in the baſtion. See BASTION and CURTIN.

DEMI-LUNE, a ſmall flanked baſtion, placed before the point of a baſtion when it is too weak. This work is alſo ſometimes placed before the curtin, when the moat is a little wider than it ought to be.

DEMI-QUAVER, a note in muſic, two of which are equal to a quaver. See the articles SEMI-QUAVER and QUAVER.

DEMI SEMI-QUAVER, in muſic, the ſhorteſt note, two of them being equal to a ſemi-quaver. See the articles SEMI-QUAVER, CHARACTER, &c.

DEMOCRACY, the ſame with a popular government, wherein the ſupreme power is lodged in the hands of the people: ſuch were Rome and Athens of old; but as to our modern republics, Baſil only excepted, their government comes nearer to ariſtocracy than democracy.

DEMOISELLE, in ornithology, a bird of the crane kind, ſomething leſs than a heron, known alſo by the name of the dancing bird, on account of its frequent leaping and turning round, and varying the motion of its head at the ſame time. Immediately from behind each eye, ſprings forth a tuft of long, ſoft, white feathers, which tend backwards in a very graceful manner, and wave with the leaſt air. The fore-part of the neck, on the contrary, is covered with ſoft, long, and ſlender black feathers, which fall on the breaſt in a very pleaſing manner, ſometimes cloſe, and at other times detached like a lady's tippet.

DEMONSTRABLE, a term uſed in the ſchools, to ſignify that a thing may be clearly proved. Thus it is demonſtrable, that the three angles of a triangle are equal to two right ones.

DEMONSTRATION, a method of reaſoning, whereby the mind clearly perceives the agreement or diſagreement between the ideas it conſiders. This knowledge, though it be certain, is not ſo clear and evident as intuitive knowledge. It requires pains and attention, and ſteady application of mind, to perceive the agreement or diſagreement it conſiders; and there muſt be a progreſſion by ſteps and degrees, before the mind in this way can arrive at certainty. Before demonſtration, there was a doubt, which in intuitive knowledge cannot happen to the mind that has its faculty of perception left to a degree capable of diſtinct ideas, no more than it can be a doubt to the eye that can diſtinctly ſee white and black, whether this ink and paper be all of a colour. In every ſtep that reaſon makes in a demonſtrative knowledge, there is an intuitive knowledge of that agreement or diſagreement it ſeeks with the next intermediate idea, which it uſes as a proof; for, if it were not ſo, that would yet need a proof, ſince, without the perception of ſuch agreement or diſagreement of the intermediate ideas, there is no knowledge produced. Each ſtep and progreſſion of the demonſtration muſt alſo be exactly carried in the mind, and a man muſt be ſure that no part is left out; which, becauſe, in long deductions, the memory cannot eaſily retain, this knowledge becomes more imperfect than intuitive, and men often embrace falſhoods for demonſtrations.

DEMONSTRATIVE, in rhetoric, one of the kinds of eloquence, viz. that which obtains in the compoſition of panegyrics, invectives, &c. See the article RHETORIC.

DEMONSTRATIVE, in grammar, a term given to ſuch pronouns as ſerve to indicate or point out a thing. Of this number are, *hic*, *hæc*, *hoc*, among the Latins; and *this*, *that*, *theſe*, *thoſe*, in Engliſh. See PRONOUN.

DEMULCENTS, among phyſicians, medicines good againſt acrimonious humours. Such are the roots of marſh-mallows, white lilies, of liquorice, and of viper graſs, the five emollient herbs. See the article EMOLLIENT.

DEMURRAGE, in commerce, an allowance made to the maſter of a ſhip by the merchants, for ſtaying in a port longer than the time firſt appointed for his departure.

DEMURRER, in law, a ſtop put to any action upon ſome point of difficulty, which muſt be determined by the court, before any further proceedings can be had in the ſuit.

DEMURRER *to Evidence*, is where a queſtion of law ariſes thereon; as if the plaintiff in a ſuit gives in evidence any records, deeds, writings, &c. upon which a law-queſtion ariſes, and the defendant offers to demur upon it, then the plaintiff muſt join in ſuch demurrer, or wave his evidence.

DEMURRER *to Indictments*, is when a criminal joins iſſue upon a point of law in an indictment or appeal, allowing the fact as laid to be true. And if the indictment, or appeal, prove good in the opinion of the judges by whom the demurrer is to be tried, and not by the inqueſt, they proceed to judgment and execution, as if the party had been convicted by confeſſion or verdict.

DENARIUS, in Roman antiquity, the chief ſilver coin among the Romans, worth in our money about ſeven-pence three farthings. As a weight, it was the ſeventh part of a Roman ounce.

DENARIUS is alſo uſed in our law books for an Engliſh penny.

DENDRACHATES, in natural hiſtory, the name uſed by the ancients for an extremely elegant and beautiful ſpecies of agate, the ground of which is whitiſh, variegated with veins of a brighter white.

DENDRA-

DENDRANATOMY, a term used by some for a description of the various parts of trees, as, root, trunk, branch, bark, wood, pith, flower, fruit, &c.

The word is formed from the Greek, δενδρος, a a tree, ανα, and τεμνω, to dissect.

DENTRITÆ, in natural history, a name given to those species of septariæ which have representations of trees, &c.

DENEB, an Arabic term signifying tail, used by astronomers to denote several fixed stars. Thus deneb elecet, signifies the bright star in the lion's tail. Deneb adigege, that in the swan's tail, &c.

DENIER, a small French copper coin, of which twelve make a sol.

DENIZEN, in law, an alien made a subject by the king's letters patent, otherwise called donaison, because his legitimation proceeds *ex donatione regis*, from the king's gift.

DENOMINATION, a name imposed on any thing, usually expressing some predominant quality.

DENOMINATIVE QUALITY, that quality from which things take their denomination.

DENOMINATOR, in arithmetic, a term used in speaking of fractions.

The denominator of a fraction is the number below the line, shewing into how many parts the integer is supposed to be divided. Thus in the fraction $\frac{3}{4}$, the number 4 shews that the integer is divided into four parts. So in the fraction $\frac{a}{b}$, b is the denominator. See the article FRACTION.

Denominator of a ratio is the quotient arising from the division of the antecedent by the consequent. Thus 8 is the denominator of the ratio 40 : 5, because 40 divided by 5, gives 8 for a quotient. It is also called the exponent of a ratio. See the article EXPONENT.

DENSHRING, or DEVENSHRING, in husbandry. See DEVENSHRING.

DENSITY *of Bodies*, or fluids, in physics, is that property or habitude whereby they contain a certain quantity of matter under a certain bulk; accordingly, that body which contains more matter than another under the same bulk, is said to be denser than that other.

The laws of density, in general, are as follows:

1. Bodies of the same density contain equal masses under equal bulks.

2. If the bulks of two bodies are equal, their densities are as their masses. Consequently

3. The densities of equal bodies are as their gravities.

4. If two bodies have the same density their masses are as their bulks.

5. The quantities of matter contained in any two bodies are in a ratio compounded of their density and bulk.

It will therefore follow, that their gravity is in the same ratio.

6. If the masses, or gravities of two bodies are equal, their densities are reciprocally as their bulks.

7. The densities of any two bodies are in a ratio compounded of the direct ratio of their masses, and a reciprocal one of their bulks. Consequently,

8. Since the gravity of bodies is as their masses, their densities are in a ratio compounded of the direct ratio of their gravities, and a reciprocal one of their bulks.

Note, The same properties, or laws of density are to be observed with regard to fluids of all kinds whatever.

DENTALIUM, in natural history, a simple shell having no hinge, and formed only of one piece: it is of a figure approaching to cylindric or conic, and is sometimes crooked, sometimes straight; sometimes closed at one end, sometimes open at both: its animal inhabitant is called nereis.

DENTARIA, tooth-wort, in botany, a genus of plants, bearing cruciform flowers, each of which consists of four obtuse petals, with six stamina, two of which are shorter than the others. The fruit is a long, cylindrical, bilocular pod, opening with two valves, and includes a number of roundish seeds.

The root is the only part used in medicine, and is accounted drying and astringent.

DENTATED LEAF, among botanists, one notched at the edges with a number of blunt points, in some measure resembling teeth.

DENTICLES, or DENTILS, in architecture, an ornament in corniches, bearing some resemblance to teeth, particularly used in the Ionic and Corinthian orders. They are cut on a little square member, properly called denticulus, and the notches or ornaments themselves, dentils. In the ancient times dentils were never used in the Ionic corniche, yet they are found in the remains of the theatre of Marcellus, which some take for an argument that Vitruvius had not the direction of that building. Vitruvius prescribes the breadth of each dentil to be half its height, and the indentine or interval between each two, he directs to be two thirds of the breadth of the dentil.

DENTIFORM PROCESS, in anatomy. See the article PYRENOIDES.

DENTIFRICE, in medicine, a remedy for rubbing the teeth, and purging them from sordes; and for cleansing and absterging the gums, when replete with humours. There are dentifrices of various kinds and forms, some in form of a powder composed of corals, pumice-stone, salt, alum, egg-shells, crabs-claws, hartshorn, &c.

The generality of operators for the teeth allow acids, such as spirit of salt, &c. to be the readiest of all dentifrices, to take off the foulness and yellowness

lowneſs of the teeth: but yet they do not adviſe a frequent uſe of theſe remedies, as they wear away too much of the teeth, and injure the gums.

DENTILS, in architecture, the ſame with denticles. See the article DENTICLES.

DENTISCALPRA, in ſurgery, an inſtrument for ſcouring yellow, livid, or black teeth; to which being applied, near the gums, it ſcrapes off the foul morbid cruſt.

DENTITION, the breeding, or cutting the children.

DENUNCIATION, a ſolemn publication, or promulgation of any thing.

DEOBSTRUENTS, in pharmacy, ſuch medicines as open obſtructions. See the article DETERGENT.

DEODAND, in our cuſtoms, implies a thing devoted or conſecrated to God, for the pacification of his wrath, in caſe of any misfortune; as a perſon's coming to a violent end, without the fault of any reaſonable creature; as if a horſe ſhould ſtrike his keeper, and ſo kill him. In this caſe, the horſe is to be a deodand; that is, he is to be ſold, and the price diſtributed to the poor, as an expiation of that dreadful event.

DEPART, in chemiſtry, a method of refining, or ſeparating gold from ſilver, by means of aquafortis, generally called quartation.

DEPARTURE, in law, ſignifies a departing or going from a plea given in bar of an action. It is likewiſe uſed where a plaintiff in his declaration ſets forth one thing, and after the defendant has pleaded thereto, he in his replication ſhews new matter different from his declaration.

DEPARTURE, in navigation, is the eaſting or weſting of a ſhip, with regard to the meridian it departed or ſailed from; or it is the difference of longitude between the preſent meridian the ſhip is under, and that where the laſt reckoning or obſervation was made; and, in all places, except under the equator, it muſt be accounted according to the number of miles in a degree of the parallel the ſhip is in.

The departure, in plane and Mercator's ſailing, is always repreſented by the baſe of a right-angle triangle, where the courſe is the angle oppoſite to it, and the diſtance the hypothenuſe. In the plane and Mercator's chart, as radius to the diſtance, ſo is the ſine of the courſe to the departure.

But this is erroneous, except in very ſmall diſtances; for if the diſtance and difference of latitude be repreſented by the hypothenuſe and perpendicular of a right-angled plain triangle, the departure will not be the baſe of that triangle.

DEPHLEGMATED, an appellation given to ſpirits well freed from phlegm.

DEPHLEGMATION, in chemiſtry, the ſame as rectification, or the freeing a ſpirit from its phlegm, either by diſtillation, or ſome other means.

DEPILATORY MEDICINES, thoſe applied in order to take off the hair: ſuch are lime and orpiment known to be, but which ought to be uſed with great caution.

DEPONENT, in Latin grammar, a term applied to verbs which have active ſignifications, but paſſive terminations or conjugations, and want one of their participles paſſive.

DEPONENT, in law, a perſon who makes a depoſition. See the article DEPOSITION.

DEPOPULATION, the act of committing waſte.

DEPOSITION, in law, the teſtimony given in court by a witneſs, upon oath.

DEPRECATION, in rhetoric, a figure whereby the orator invokes the aid and aſſiſtance of ſome one; or prays for ſome great evil or puniſhment to befal him who ſpeaks falſely, either himſelf or his adverſary.

DEPRECATORY, or DEPRECATIVE, in theology, a term applied to the manner of performing ſome ceremonies in the form of prayer.

DEPRESSION *of Equations*. See the article EQUATIONS.

DEPRESSION *of the Pole*. When a perſon ſails or travels towards the equator, he is ſaid to depreſs the pole, becauſe as many degrees as he aproaches nearer the equator, ſo many degrees will the pole be nearer the horizon. This phænomenon ariſes from the ſpherical figure of the earth.

DEPRESSOR, or DEPRIMENS, in anatomy, a name applied to ſeveral muſcles, becauſe they depreſs the parts they are faſtened to.

DEPRESSOR LABII SUPERIORIS, or TRIANGULARIS, is a muſcle that ariſes from the lower edge of the under jaw, between the maſſeter and quadratus, and aſcends by the angle of the mouth to the upper-jaw. Theſe two muſcles acting together, expreſs a ſorrowful countenance, becauſe they draw downwards the corners of the mouth and cheeks.

DEPRESSORES NASI, a pair of muſcles ariſing from the os maxillare, above the dentes inciſores; and are inſerted into the extremities of the alæ, which they pull downwards.

DEPRESSOR ANGULI ORIS, a name given by Albinus to the muſcle called by others depreſſor labiorum communis. See the article DEPRESSOR LABII.

DEPRESSORES OCULI, a pair of muſcles ſpringing from each corner of the eye, and anſwered by another pair of the like figure and ſtructure, in the lower eye-lid. See the article EYE.

DEPRIVATION, in the canon-law, the depoſing a biſhop, parſon, vicar, &c. from his office and preferment.

DEPTH, in geometry, the ſame with altitude; though, ſtrictly ſpeaking, we only uſe the term depth to denote how much one body, or part of a body, is below another.

DEPTH *of a Battalion or Squadron*, in military affairs, the number of ranks, or the quantity of men, of which each file consists in a battalion or squadron.

The depth of the battalion is generally four men, and that of the squadron three.

So that if the battalion consists of six hundred men, each rank will be one hundred and fifty.

The first rank is called the front of the battalion or squadron, and the last the rear. The files which bind it on the right and left are called the flanks.

DEPURATION, in pharmacy, is the separating or freeing any fluid from all heterogeneous matter or feculencies, and thereby rendering every part of it of a similar consistence and appearance.

DEPURATORY FEVER, a name given by Sydenham to a fever which prevailed much in the years 1661, 1662, 1663, and 1664. He called it depuratory, because he observed that nature regulated all the symptoms in such a manner, as to fit the febrile matter, prepared by proper concoction, for expulsion in a certain time, either by a copious sweat, or a freer perspiration.

DEPUTATION, a mission of select persons out of a company, or body, to a prince or assembly, to treat of matters in their name. They are more or less solemn, according to the quality of those who send them, and the business they are sent upon.

DERELICTS, in the civil law, such goods as are wilfully relinquished by the owner.

DERELICT signifies also a thing forsaken, or cast away by the sea.

DERIVATION, in medicine, is when a humour, which cannot be conveniently evacuated at the part affected, is attracted from thence, and discharged at some more proper place in its vicinity; or is drawn from a noble to a more ignoble part, where it is less capable of doing injury. Thus a blister is applied upon the neck to draw thither the matter, in cases of defluxions upon the eyes.

DERIVATIVE, in grammar, a word which is derived from another, called its primitive. See PRIMITIVE.

Thus manhood is derived from man, deity from deus, and lawyer from law.

DERVIS, a name given to all Mahometan monks, though of various orders.

DESART, a large extent of country entirely barren, and producing nothing. In this sense some are sandy deserts, as those of Lop, Xama, Arabia, and several others, in Asia and Africa, those of Lybia and Zara: others are stony, as the desart of Pharan in Arabia Petrea.

The DESART, absolutely so called, is that part of Arabia south of the Holy Land, where the children of Israel wandered forty years.

DESCANT, in music, the art of composing in several parts. See COMPOSITION.

Descant is three-fold, viz. plain, figurative, and double.

Plain DESCANT is the ground-work and foundation of all musical compositions, consisting altogether in the orderly placing of many concords, answering to simple counterpoint. See the article COUNTERPOINT.

Figurative or *Florid* DESCANT, is that part of an air of music, wherein some discords are concerned, as well, though not so much, as concords. This may be termed the ornamental and rhetorical part of music, in regard that there are introduced all the varieties of points, syncopes, diversities of measures, and whatever is capable of adorning the composition.

DESCANT *Double*, is when the parts are so contrived, that the treble, or any high part, may be made the bass; and, on the contrary, the bass the treble. See the articles HARMONY, COUNTERPOINT, and MELODY.

DESCENDANT, in genealogy, a term relative to ascendant, and applied to a person who is born or issued from some other referred to: thus, mankind are said to be the descendants of Adam; and sometimes the descendants of Noah.

DESCENSION, in astronomy, is either right or oblique.

The right descension of any celestial object, is that point of the equinoctial which sets at the same time with that object in a right sphere, reckoned from the first point of Aries.

The oblique descension is the same thing in an oblique sphere.

DESCENSIONAL DIFFERENCE, is the degrees and minutes, &c. reckoned on the equinoctial, between the two points described in the preceding article.

DESCENT, in general, is the tendency of a body from a higher to a lower place.

DESCENT of heavy bodies, is that uniform accelerated motion with which they tend towards the center of the earth. See the article ACCELERATION.

DESCENT, or DISCENT, in law, an order or method whereby lands or tenements are derived to any man from his ancestors.

DESCENT, in heraldry, is used to express the coming down of any thing from above: as, a lion en descent, is a lion with his head towards the base points, and his heel towards one of the corners of the chief, as if he were leaping down from some high place.

DESCENTS, in fortification, are the holes, vaults, and hollow places made by undermining the ground.

The descent into the moat, or ditch, is a deep passage made through the esplanade and covert-way, in form of a trench, whereof the upper-part is covered with madriers and clays, to secure the besiegers

beſiegers from the enemy's fire. In wet ditches this trench is on a level with the ſurface of the water, but in dry ones it is ſunk as deep as the bottom of the ditch.

DESCRIBENT, in geometry, a line or ſurface, which by moving parallel to itſelf, deſcribes a ſurface or ſolid.

DESCRIPTION is ſuch a ſtrong and beautiful repreſentation of a thing, as gives the reader a diſtinct view and ſatisfactory notion of it.

DESERTER, in a military ſenſe, a ſoldier who, by running away from his regiment or company, abandons the ſervice.

DESHACHE, in heraldry, is where a beaſt has its limbs ſeparated from its body, ſo that they ſtill remain on the eſcutcheon, with only a ſmall ſeparation from their natural places.

DESIDERATUM is uſed to ſignify a deſirable perfection in any art or ſcience: thus, it is a deſideratum with the blackſmith, to render iron fuſible by a gentle heat, and yet preſerve it hard enough for ordinary uſes; with the glaſs-man and looking-glaſs maker, to render glaſs malleable; with the clock-maker, to bring pendulums to be uſeful, where there are irregular motions; with the brazier and copper-ſmith, to make malleable ſolder; with the ſhipwright, to build veſſels that will ſail under water; with the diver, to procure manageable inſtruments for conveying freſh air to the bottom of the ſea, ſufficient for reſpiration, and the burning of lights; with the aſſay-maſter, to melt or copel ores or metals immediately, without the uſe of bellows or furnaces; and with the carvers and joiners, to faſhion wood in moulds like plaſter of Paris, or burnt alabaſter, &c.

DESIGN, in a general ſenſe, the plan, order, repreſentation, or conſtruction of a building, book, painting, &c.

In building, the term ichnography may be uſed, when by deſign is only meant the plan of a building, or a flat figure drawn on paper: when ſome ſide or face of the building is raiſed from the ground, we may uſe the term orthography; and when both front and ſides are ſeen, in perſpective, we may call it ſcenography.

DESIGN, in the manufactories, expreſſes the figures wherewith the workman enriches his ſtuff, or ſilk, and which he copies after ſome painter, or eminent draughtſman, as in diaper, damaſk, and other flowered ſilk and tapeſtry, and the like.

DESIGN is alſo uſed, in painting, for the firſt idea of a large work, drawn roughly, and in little, with an intention to be executed and finiſhed in large. The art of painting has been by ſome of the greateſt maſters divided into the deſign, or draught, the proportion, the expreſſion, the claro-obſcuro, the ordonnance, the colouring, and the perſpective.

DESIGNING, the art of delineating or drawing the appearance of natural objects, by lines on a plane.

DESPOTICAL, in general, denotes any thing that is uncontrouled and abſolute; but is particularly uſed for an arbitrary government, where the power of the prince is unlimited, and his will a law to his ſubjects: ſuch are thoſe of Turky, Perſia, and moſt of the Eaſtern governments; and even thoſe of Europe, if we except the republics, England, and the Swediſh government.

DESPOUILLE, in heraldry, the whole caſe, ſkin, or ſlough of a beaſt, with the head, feet, tail, and all appurtenances, ſo that being filled and ſtuffed, it looks like the entire creature.

DESPUMATION, a term ſometimes uſed for the clarifying a liquor, by the ſkimming of its froth.

DESSERT, or DESART, a ſervice of fruits and ſweatmeats, uſually ſerved up laſt to table.

DESSICCATIVE, or DESICCATIVE, in pharmacy, an epithet applied to ſuch topical medicines as dry up the humours flowing to a wound or ulcer.

DESTINY, among philoſophers and divines, the ſame with fate. See FATE.

DESUDATION, in medicine, a profuſe and inordinate ſweat, ſucceeded by an eruption of puſtulet, called ſudamina, or heat-pimples. See the articles SUDAMINA and HIDRO.

DETACHED PIECES, in fortification, are ſuch out-works as are detached, or at a diſtance from the body of the place; as demilunes, ravelines, baſtions, &c. In painting, the figures are ſaid to be well detached, when they ſtand free and diſengaged from each other.

DETACHMENT, in military affairs, a certain number of ſoldiers drawn out from ſeveral regiments or companies equally, to be employed as the general thinks proper, whether on an attack, at a ſiege, or in parties to ſcour the country.

A detachment of two or three thouſand men, is a command for a brigadier; eight hundred for a colonel; four or five hundred for a lieutenant-colonel. A captain never marches on a detachment with leſs than fifty men, a lieutenant, an enſign, and two ſerjeants. A lieutenant is allowed thirty, and a ſerjeant; and a ſerjeant ten or twelve men. Detachments are ſometimes made of entire ſquadrons and battalions.

DETACHMENT, in naval affairs, a certain number of ſhips choſen by an admiral or commodore from the reſt of the fleet or ſquadron, and appointed to execute ſome particular commiſſion.

DETENTS, in clock-work, are thoſe ſtops which, by being lifted up or let down, lock or unlock the clock in ſtriking. See the article CLOCK-WORK.

DETENT-WHEEL, or HOOP-WHEEL, in a clock,

clock, that wheel which has a hoop almoſt round it, wherein there is a vacancy at which the clock locks.

DETERGENTS, *Detergentia*, in pharmacy, ſuch medicines as are not only ſoftening and adheſive, but alſo, by a peculiar activity, conjoined with a ſuitable configuration of parts, are apt to abrade, and carry along with them ſuch particles as they lay hold on in their paſſage.

DETERMINATE PROBLEM, in geometry, that which has but one, or at leaſt a limited number of anſwers.

DETERMINATION, in mechanics, ſignifies much the ſame with the tendency or direction of a body in motion.

DETERMINATION, among ſchool-divines, is an act of divine power, limiting the agency of ſecond cauſes, in every inſtance, to what the Deity predeſtinated concerning them. See PREDESTINATION.

DESTINUE, in law, a writ or action that lies againſt one who has got goods or other things delivered to him to keep, and afterwards refuſes to deliver them.

DETINUE *of Charters*. An action for detinue lies for deeds and charters which make the title to lands.

DETONATION, in chemiſtry, the noiſe and exploſion which any ſubſtance makes upon the application of fire to it. It is alſo called fulmination.

DETRAHENS QUADRATUS, in anatomy, a muſcle otherwiſe called platyſma. See the article PLATYSMA.

DETRANCHE, in heraldry, a line bendwiſe, proceeding always from the dexter ſide, but not from the very angle, diagonally athwart the ſhield.

DEVENSHRING, or DENSHRING, a term uſed in many parts of England for burning of land. See BURNING *of Land*.

DEVIATION, in the old aſtronomy, a circle invented to account for the excentricity and difference in the diſtance of the planets when in apogee and perigee.

In the Ptolemaic ſyſtem, it is called the deviation of the epicycle.

DEVIL, διαβολος, an evil angel, one of thoſe celeſtial ſpirits caſt down from heaven, for pretending to equal himſelf with God.

DEVISE, or DEVICE, in heraldry, painting, and ſculpture, an emblem uſed to repreſent a certain family, perſon, action, or quality; with a ſuitable motto, applied in a figurative ſenſe. See MOTTO.

The eſſence of a deviſe conſiſts in the metaphorical ſimilitude between the things repreſenting and repreſented.

DEVISE is frequently alſo uſed for a cipher. See the article CIPHER.

DEVISE, in law, the act whereby a perſon bequeaths his lands or tenements to another, by his laſt will and teſtament.

DEVOTION, *Devotio*, a ſincere ardent worſhip of the Deity.

DEVOTION, among the Romans, was a kind of ſacrifice, or ceremony, whereby they conſecrated themſelves to the ſervice of ſome perſon.

DEVOURING, in heraldry, is when fiſhes are borne in an eſcutcheon in a feeding poſture; for they ſwallow all the meat whole.

DEVUIDER, in the manege, is applied to a horſe that, upon working upon volts, makes his ſhoulders go too faſt for the croupe to follow; ſo that, inſtead of going upon two heads as he ought, he endeavours to go only upon one.

DEUNX, in Roman antiquity, eleven ounces, or $\frac{11}{12}$ parts of the Libra. See LIBRA.

DEUS, GOD, among divines and philoſophers. See the article GOD.

DEUTERO-CANONICAL, in theology, a term applied to certain books of Scripture which were added to the canon after the reſt; either becauſe they were not wrote till after the canon was compiled, or becauſe of ſome debate in regard to their canonicity.

DEUTERONOMY, a canonical book of the Old Teſtament, and the laſt of the pentateuch of Moſes.

This book was called Deuteronomy by the ſeventy Greek tranſlators, as being a recapitulation of the laws before delivered at large.

DEUTEROSIS, the Greek name by which the Jews called their miſchnah, or ſecond law.

DEW, a light, thin, inſenſible rain or miſt, falling on the earth while the ſun is below the horizon.

Sun DEW, in botany. See the article DROSERA.

DEW-BERRY, in botany. See the article RUBUS.

DEXTANS, in Roman antiquity, ten ounces, or $\frac{10}{12}$ of their libra. See the article LIBRA.

DEXTER, in heraldry, an appellation given to whatever belongs to the right-ſide of a ſhield, or coat of arms: thus we ſay, bend-dexter, dexter-point, &c.

DEY, in matters of government, the ſovereign prince of Algiers, anſwering to the bey of Tunis.

DIABETES, from διαβαινω, to paſs off, in phyſic, that diſcharge of urine, when any liquor, ſoon after it is drank, is immoderately, and without undergoing almoſt any change, evacuated crude, and under the appearance of water.

In this diſorder the patient is continually afflicted with an inſatiable thirſt, that cannot be removed by drinking the moſt liberal draughts. The liquor drank is often diſcharged by urine, in larger quantities than it was taken into the ſtomach. Thus the whole body is, by this means, conſumed, and as it were diſſolved; though, in ſome patients, the loins, the thighs, the teſtes, and eſpecially the feet, become a little turgid, and a certain heat is perceived in the inteſtines.

A diabetes is a diſeaſe of the chronical kind, and depends upon the ſtate of the kidnies: when recent, it ſometimes admits of a cure; but when inveterate, and of long ſtanding, it becomes incurable.

According to Liſter, nothing more effectually contributes to the cure of this diſorder, than all preparations of almonds, and a milk diet; and he himſelf gives us an inſtance of one cured of it by drinking as much wine, boiled with ginger, as his ſtrength and condition would admit of; allowing him, at proper intervals, draughts of milk and water, to allay his thirſt.

According to Willis, few or none at all have been obſerved to be cured of a diabetes by aſtringents; and this practitioner, as he himſelf informs us, often preſcribed, with ſucceſs, the tincture of antimony, and a ſolution of quick-lime in water, together with ſaſſafras, aniſeeds, raiſins, and liquorice.

As to the cure of the diabetes by Briſtol waters, ſee the article BRISTOL *Water*.

DIACAUSTIC CURVE, is ſuppoſed to be generated in the following manner.

When the rays that iſſue from a radiated point are refracted by a given curve, ſo that the ſine of the angle contained by that refracted ray, and the perpendicular to the curve, is always to the ſine of the angle, contained by the incident ray, and that perpendicular in one conſtant ratio; the curve that touches all the refracted rays is called the diacauſtic curve, or cauſtic by refraction. Thus, let S (Plate XLI. *fig.* 4.) be the radiating point, S L any incident ray, L R the refracted ray, C the center of the curvature at L, C I perpendicular from C on the incident ray in I, C R perpendicular on the refracted ray in R; join S C and I R; let R Z perpendicular to R I meet C I in Z; join L Z meeting S C in Q, and let Q M parallel to R Z meet the refracted ray L R in M: then ſhall M be in the cauſtic. For, ſuppoſing the refracted ray L R to touch the cauſtic in any point M, and L T parallel to C I to meet S C in T, and the point L in deſcribing the curve B L to move towards *l*; then the angular velocity of S I about S ſhall be to the angular velocity of M R about M in the ratio compounded of the direct ratio of the fluxion of C I to the fluxion of C R (or the ratio of C I or C R, by art. 27. of Maclaurin's fluxions, the ratio of C I the ſine of the angle of incidence to C R the ſine of the angle of refraction being ſuppoſed invariable) and of the inverſe ratio of S I to R M. The angular velocity of S L about S is to the angular velocity of M L about M (by art. 208, and 202, of the ſame book.) in the direct ratio of L I to L R (or of C Z to C R, becauſe the triangles C Z R, L I R are ſimilar) and the inverſe ratio of S L to L M. Therefore L M is to R M as the rectangle contained by C I and S L is to the rectangle contained by S I and C Z, or (becauſe S I is to S L as C I is to L T) as L T is to C Z, or L Q to Z Q; conſequently, Q M and Z R are parallel, and the point M was rightly determined. When the incident rays are parallel, let C B parallel to thoſe rays through the center of curvature meet L Z in Q, and Q M parallel to R Z ſhall meet the refracted ray L R in the cauſtic at M. When the incident ray becomes perpendicular to the refracting curve, that is, when L comes to B, the angular velocity of S L is to the angular velocity of Q L as Q B is to S B; therefore the cauſtic meets S C in Q ſo that C Q is to B Q in the ratio compounded of the given ratio of C R (the ſine of refraction) to C I (the ſine of incidence) and of that of S C to S B: and when the incident rays are parallel, C Q is to B Q as the ſine of refraction is to the ſine of incidence.

Deſcribe the circle L I C V upon the diameter L C, let C V parallel to the incident ray S I meet this circle in V; and R Z ſhall always paſs through V, the center of curvature C and incident ray S L being given. Therefore the point M is determined by applying C R in this circle, ſo that it may be to C I in the given ratio of the ſine of refraction to the ſine of incidence, joining V R that meets C I perpendicular from C to the incident ray in Z, joining L Z that meets S C in Q, and drawing Q M parallel to V R. When L Z is parallel to S C, the refracted ray is the aſymptote of the cauſtic.

Let B L (*fig.* 5.) be a circle, and, the incident rays being ſuppoſed parallel, let the cauſtic touch the refracted ray L M in M, a point of the circle; then, becauſe L R is equal to R M, L Q and C I are biſected in Z and I: and, the triangles C R Z, L R I being ſimilar, it follows, that C Z, or one half of C I, is to C R as L I is to L R. Therefore, if the invariable ratio of the ſine of incidence to the ſine of refraction be expreſſed by that of I to R, the ſquare of I ſhall be to the ſquare of 2 R as the ſquare of L I to the ſquare of L R, and 4 R R—I I ſhall be to I I as the difference of the ſquares of L R and L I, or of C I and C R, is to the ſquare of L I; conſequently, 3 R R is to I I—R R as the ſquare of the radius C L is to the ſquare of L I, or C V: and in this manner Sir Iſaac Newton determines the poſition of the ray that, after a refraction at L, a reflexion at M, and a ſecond refraction at G, defines the interior rainbow; for, the rays incident about L being refracted ſo as to touch the cauſtic near to M, a point in the circle B L M, and being thence reflected, they will emerge nearly parallel at G. If it be required that the rays refracted about L (*fig.* 6.) ſhould be reflected at *l* in the circle nearly parallel to each other; then, by art. 411. M R muſt be equal to M *l*, or one half of L R, Z Q muſt be one half of L Z, C Z one half of Z I, and therefore equal to one third part of C I. But L I is to L R as C Z is to C R, or as I is to 3 R, and 9 R R—I I is to I I—R R as the ſquare of C I is to the ſquare of L I; therefore 8 R R is to

II—RR as the square of the radius CL is to the square of LI, or CV; and hence the ray is determined which, after a refraction at L, two reflections at *l* and G, and a second refraction at H, defines the exterior rainbow; for, if G *m* be one fourth part of GH, or of L*l*, the rays reflected at G shall touch a caustic formed by this second reflexion at *m*, and emerge parallel after their refraction at H.

DIACELTATESSON, in chemistry, a name given by Van Helmont, to a purging preparation procured from the fixed flowers of antimony.

DIACENTROS, a term used by Kepler, for the lesser diameter of a planet's orbit.

DIACHALCITIS, in surgery and pharmacy, a plaster composed of oil, axungia, and chalcitis, which formerly used to be applied after the amputation of a cancer, and on many other occasions.

DIACHYLON, in pharmacy, an emollient digestive plaster, composed of the mucilages or juices of certain herbs, litharge, and oil.

The word is formed from the Greek, διὰ and χυλος, juice.

DIACODIUM, in pharmacy, a syrup prepared from the heads of poppies.

The word is formed from the Greek, διὰ and κωδεια, a poppy-head.

DIACOPE, in grammar, the same with tmesis. See the article TMESIS.

DIACOUSTICS, or DIAPHONICS, is the doctrine, or consideration of the properties of sound, refracted in passing through different mediums; that is, out of a dense into a more rare, or out of a rare into a denser, medium. See SOUND.

DIADELPHIA, the name of the seventeenth class in the Linnæan system of botany; and comprehends all such plants as bear hermaphrodite and papilionaceous flowers, and leguminous seed vessels.

The distinguishing characteristic of this class, is that the corolla is unequal, and the petals are express by distinct names. See the articles VEXILLUM, ALA, and CARINA.

The filaments form two dissimilar bodies: the lower one that involves the pistil; and the upper one incumbent on it: the former of these, from the middle downwards, is cylindraceous, membranaceous, and split lengthways on its upper side; but the upper half terminates in nine subulated parts, that are of the same length with, and follow the flexure of the carina of the corolla; and of which the intermediate or lower radii are longer by alternate pairs. The upper filament is single and awl-shaped; and covers the slit of the cylindraceous part of the under one. The antheræ, reckoned together, are ten in number; one on the upper filament, and nine on the under. To this may be added, that the pistil is single, growing out of the recepticle within the calyx. The germen is oblong, roundish, and lightly compressed. The style is subulate, filiform, and ascending of the same length and position of the radii of the filament: and the stigma is downy the length of the style from the part, turned upwards, and immediately below the antheræ.

This class is the most natural; the leaves are food for cattle, and the seeds for tame quadrupeds; and comprehends peas, beans, vetches, and a number of other genera.

DIADEM, in antiquity, a head-band, or fillet, worn by kings, as a badge of their royalty. It was made of silk, thread, or wool, and tied round the temples and forehead, the ends being tied behind, and let fall on the neck. It was usually white, and quite plain, though sometimes embroidered with gold, and set with pearls and precious stones. In latter times it came to be twisted round crowns, laurels, &c. and even appears to have been worn on divers parts of the body. See CROWN.

DIADEM, in heraldry, is applied to certain circles, or rims, serving to inclose the crowns of sovereign princes, and to bear the globe and cross, or the fleur de luces for their crest. The crowns of kings are bound, some with a greater, and some with a less number of diadems. The bandage about the heads of Moors on shields is also called diadem, in blazoning.

DIADROME, in physics, the same with vibration, which see.

DIÆRESIS, in surgery, an operation serving to divide and separate the part, when the continuity is a hindrance to the cure. Some professors divide surgery into six parts, assigning to each Greek names, of which diæresis is one.

DIÆRESIS, in medicine, is the consuming of the vessels of an animal body, when from some corroding cause certain passages are made, which naturally ought to have been; or certain natural passages are dilated beyond their ordinary dimensions, so that the humours which ought to have been contained in the vessels extravasate or run out.

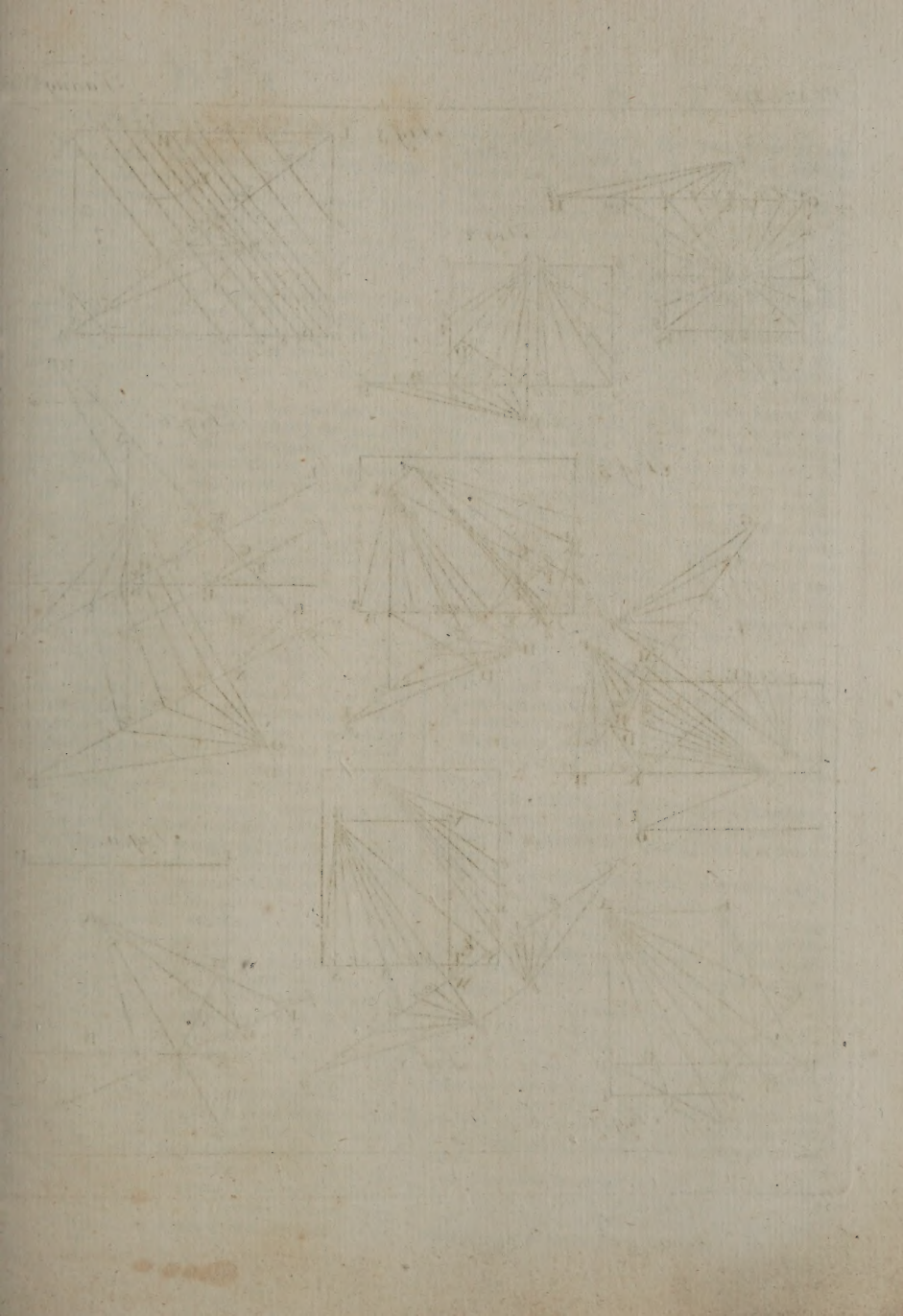
DIÆRESIS, in grammar, the division of one syllable into two, which is usually noted by two points over a letter, as aulaï instead of aulæ, dissoluenda for dissolvenda.

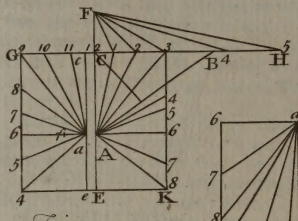
DIÆRESIS, is also the same with what is otherwise called tmesis. See TMESIS.

DIAGLYPHIC, the art of cutting or engraving figures on metals, such as seals, intaglios, matrices of letters, &c. or coins for medals. See the articles ENGRAVING and SCULPTURE.

DIAGNOSTIC, from the Greek διὰ, with or through, and γινωσκω, to know, is that judgment of a disease that is taken from the present symptoms and condition of the patient.

DIAGONAL, in geometry, a right-line drawn across a parallelogram, or other quadrilateral figure, from the vertex of one angle to that of another.





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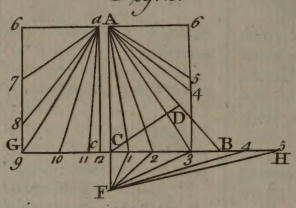

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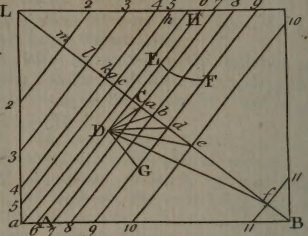

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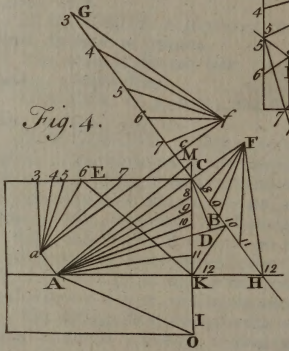

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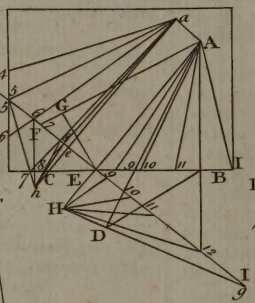

Fig. 5.

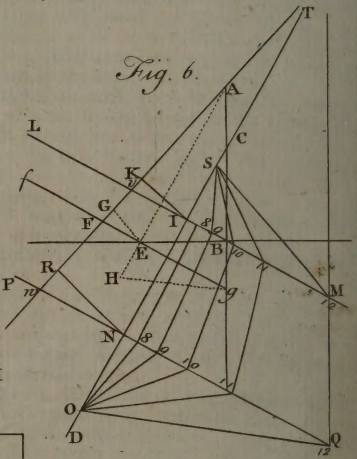

Fig. 6.

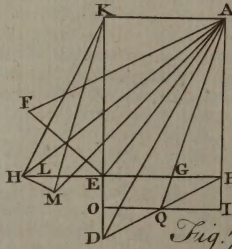

Fig. 7.

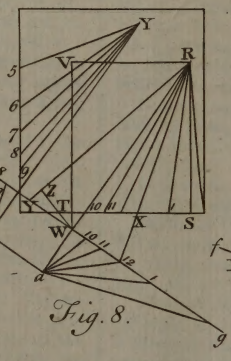

Fig. 8.

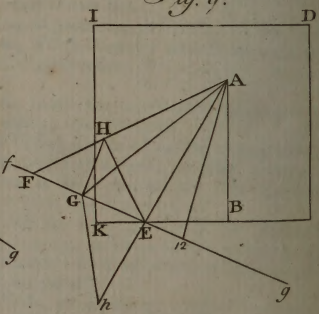

Fig. 9.

J. Lodge sculp.

Such are the line A D or B C (Plate XLI. *fig.* 7.) drawn from the angles A and B to C and D.

Some authors call it diameter, and others the diametral of the figure.

It is demonstrated, 1. that every diagonal divides a parallelogram into two equal parts: 2. two diagonals drawn in any parallelogram, bisect each other: 3. the diagonal of a square is incommensurable with one of its sides.

Add, 4. a very noble theorem in elementary geometry, first demonstrated by Mr. Lagny, in the *Memoires de l'Académie Royale des Sciences*, *An.* 1706, is that the sum of the squares of the two diagonals of every parallelogram, is equal to the sum of the squares of the four sides.

It is evident, at first sight, that the famed 47th proposition of Euclid, so richly worth the hecatomb it costs its author, is only a particular case of this proposition: for if the parallelogram be rectangled, it follows of course, that the two diagonals are equal; and, of consequence, that the square of a diagonal, or, which is the same thing, the square of the hypothenuse of a right angle, is equal to the squares of the two sides. If a parallelogram be oblique-angled, and of consequence, the two diagonals unequal, as is the more usual case; the proposition becomes of more extensive use.

The demonstration in oblique-angled parallelograms is thus: suppose the oblique-angled parallelogram A B C D, whereof B D is the greater diagonal, and A C the lesser: from the point A, of the obtuse angle D A B, let fall a perpendicular A E, to the side C D; and from the point B another perpendicular B F to the side D C. Then are the triangles A D E, B C F equal, and similar, as A D is equal to B C, and the angle A D E, B C F, as well as A E D, B C F, are also equal; consequently D E is equal to C F. Now, by Euclid, prop. 12. lib. 2. in the obtuse-angled triangle B D C, the square of the side B D is equal to the sum of the squares of B C, and C D, and over and above, to double the rectangle of C F by C D; and by the 13th, lib. 2. in the triangle D A C, the square of the side A C is equal to the sum of the squares of A D, and C D, abating double the rectangle of the same C D, by D E, equal to C F. Consequently, the former excess precisely compensating this defect; the sum of the squares of the two diagonals is equal to the sum of the squares of the four sides. Q. E. D.

Hence, in every rhombus, or lozange, knowing one side, and a diagonal; the other diagonal will likewise be known: for as the four sides are equal; subtracting the square of the given diagonal from quadruple the square of the given side; the remainder is the square of the diagonal required.

The proposition is likewise of great use in the theory of compound motions: for in an oblique-angled parallelogram, the greater diagonal being the subtense of an obtuse; and the lesser, of an acute angle, which is the complement of the former; the greater will be the greater, and the less the less, as the obtuse angle is the greater; so that if the obtuse angle be conceived to grow till it be infinitely great with regard to the acute one, or, which amounts to the same thing, if the two contiguous sides of the parallelogram be extended directly, end to end in a right line; the great diagonal becomes the sum of the two sides, and the lesser one, nothing. Now, two contiguous sides of a parallelogram being known, together with the angle they include, it is easy to find the subtense of that angle, *i. e.* one of the diagonals of the parallelogram, in numbers; which done, Mr. de Lagny's proposition gives the other. Which second diagonal thus found, is the line that would be described by a body impelled at the same time by two forces, which should have the same ratio to each other, as the contiguous sides have, and act in those two directions; which diagonal the body would describe in the same time, as it would have described either of the contiguous sides in, if only impelled by the force corresponding thereto. This is one of the great uses of the proposition: for the ratio of two forces, and the angle they make, being given, it is frequently necessary to determine, in numbers, the line a body impelled by the two forces would describe in a certain time.

DIAGRAM, in geometry, a scheme for explaining and demonstrating the properties of any figure, whether triangle, square, circle, &c. See the articles TRIANGLE, SQUARE, &c.

DIAGRAM, among ancient musicians, the same with the scale of the moderns. See the article SCALE.

DIAGRADIUM, in pharmacy, a preparation of scammony, invented by Galen; it consists in baking the scammony in a quince; but is at present seldom used.

DIAL, an instrument serving to measure time, by means of the shadow of the sun.

DIALS are differently denominated, according to their different situation, and the figure of the surface whereon they are described, for the constructing of which observe the following definitions and problems.

DEFINITIONS.

1. A dial is a plane upon which lines are described in such sort, that the shadow of the upper edge of another plane, erected perpendicular thereto, may point out the hours of the day.

2. The edge of the said plane, by which the hours of the day are marked out, is called the style of the dial, and is always parallel to the axis of the earth.

3. The Line in which the said plane intersects the plane of the dial is called the substyle.

4. The angle included between the style and substyle is called the height of the style.

The position of any dial is distinguished according as it is either parallel, perpendicular, or oblique, to the plane of the horizon of that place where it is fixed.

5. Those dials, whose planes are parallel to the plane of the horizon, are called horizontal dials.

6. Those dials, whose planes are perpendicular to the plane of the horizon, are called erect dials.

7. Those erect dials, whose planes are either parallel or perpendicular to the plane of the meridian, are called direct erect dials; because they front the four cardinal points.

8. All other erect dials are called declining dials.

9. Those dials, whose planes are neither parallel nor perpendicular to the plane of the horizon, are called inclining or reclining dials.

10. Those inclining or reclining dials, whose planes are either perpendicular to the meridian or prime vertical, are called direct inclining or reclining dials.

11. All those oblique dials, whose planes make an obtuse angle with the horizon, are called reclining dials; and those, whose planes make an acute angle with the horizon, are called inclining dials.

12. The arch of the horizon, which is intercepted between any given plane and that of the prime vertical, is said to be the declination of that plane.

13. The inclination of the plane is the angle which the plane makes with the horizon.

14. The reclination of the plane is the excess of the angle, which the plane makes with the horizon, above a right angle.

15. The intersection of the plane of the dial and that of the meridian, passing through the style, is called the meridian of the dial, or the hour-line of 12.

16. Those meridians, passing through the style, which make angles of 15°, 30°, 45°, &c. with the meridian of the place (marking the hour-line of twelve) are called hour circles; and their intersections, with the plane of the dial, hour-lines.

17. The angle, formed by the substyle and the hour line of twelve, is called the distance of the substyle from the meridian.

18. The plane's difference of longitude is the angle formed at the style by two meridians; one passing through the hour-line of twelve, and the other through the substyle.

Problem I. To describe an horizontal dial, geometrically, for any proposed latitude.

Construction. On the proposed plane draw the right line 6 A 6, (Plate XLII. *fig.* 1.) for the east and west line of the dial, or the hour-line of six; in the middle of which set off A *a* equal to the proposed thickness of your style; through A, draw C A E, *c a e* both perpendicular to 6 A 6, and let G C H be parallel thereto; make the angle C A B equal to the given latitude, and upon A B let fall the perpendicular C D; in A C produced take C F equal to C D, then make the angles C F 1, C F 2, C F 3, &c. equal to 15°, 30°, 45°, &c. respectively, and draw A 1, A 2, A 3, &c. for the hour-lines of one, two, three, &c. after noon. Moreover, take *c* 11, *c* 10, *c* 9, &c. respectively, equal to C 1, C 2, C 3, &c. and draw *a* 11, *a* 10, *a* 9, &c. for the hour-lines of eleven, ten, nine, &c. before noon.

Note, The hour-lines of four and five, whose intersections G C H fall without the plane of the dial, may be otherwise drawn in the following manner. Take A *f* equal to the excess of A C above C D, and make the angles 6 *f* 5, 6 *f* 4 equal to 15°, 30° respectively, also from the points 4, 5, where the lines *f* 4, *f* 5 intersect K 3, parallel to C E, draw A 4, A 5 for the hour-lines of four and five; from which, by taking 6, 7, and 6, 8, equal to 6, 5, and 6, 4, &c. and drawing A 7, A 8, &c. you will also have the hour-lines of seven and eight.

For the line 6 A 6 being the east and west line of the dial, the line C A E, perpendicular thereto, will therefore be the north and south line with regard to the center A, or in respect of that side of the style, by the shadow of which the hours after noon are pointed out; and it is evident that, as A *a* expresses the thickness of the style, the line *c a e* will be the north and south line of the dial, with regard to the center *a*, answering to the morning side of the style. Moreover, since the angle C A B is equal to the latitude of the place or the elevation of the pole, by construction, it is evident, that when the style C A B is erected perpendicular to the plane of the horizon, on A *a c* C, the upper edge thereof will pass through the pole of the world and so be parallel to the earth's axis.

Problem II. To describe an erect south dial, geometrically, for any given north latitude; or an erect north dial for any south latitude.

Construction. On the proposed plane, draw the right line 6 A 6 (*fig.* 2.) for the east and west line of the dial, or the hour-line of six; in the middle of which set off A *a* equal to the proposed thickness of your style, and from A, *a* draw A C, *a c* both perpendicular to 6 A 6, also let G C H be parallel thereto: make the angle C A B equal to the complement of the latitude, and upon A B let fall the perpendicular C D, then proceed as in Prob. I.

To shew that the upper edge of the style, when the dial is placed in its proper position, will be parallel to the earth's axis (as it ought to be by Definition II.) we may observe, in the first place, that the line 6 A 6, being the east and west line of the dial, and parallel to the plane of the horizon, the line A C perpendicular thereto (when the plane of the dial is erect, according to Definition VI.) will also

alſo be perpendicular to the horizon. Therefore when the plane of the ſtyle, repreſented by the triangle A C B, is erected perpendicular to the plane of the dial, on the line A C, it will coincide with the meridian (being perpendicular to the plane of the dial repreſented by the prime vertical:) and ſo the angle C B A being equal to the given latitude, or the elevation of the pole, (by conſtruction) it is evident A B the upper edge of the ſtyle, when produced, will paſs through the pole of the world, and ſo be parallel to the earth's axis.

Note, An erect north dial, for a north latitude, is conſtructed exactly in the ſame manner as an erect ſouth dial; the only difference being in the poſition of the dial: in the former caſe the line G B being made the upper edge of the dial inſtead of the lower.

The ſame may be obſerved with reſpect to an erect ſouth dial, for a ſouth latitude.

Problem III. To deſcribe an erect eaſt dial, geometrically, for any propoſed north latitude, or an erect weſt dial, for any ſouth latitude.

Conſtruction. On the propoſed plane draw the right line A B, (*fig.* 3.) for the horizontal line of the dial; make the angle L B A equal to the complement of the latitude, and, perpendicular to B L, draw A C H for the hour-line of ſix; take C *c* equal to the propoſed thickneſs of your ſtyle, and parallel to A H draw *a c h*; then having aſſumed D C at pleaſure, make the angles C D *a*, C D *b*, C D *d*, &c. equal to 15°, 30°, 45°, &c. reſpectively, and through the points *a*, *b*, *d*, &c. parallel to A C H, draw the lines 7 *a* 7, 8 *b* 8, 9 *d* 9, &c. for the hour-lines of ſeven, eight, nine, &c. Moreover, take *c g*, *c k*, *c l*, &c. equal to C *a*, C *b*, C *d*, &c. and through *g*, *k*, *l*, &c. parallel to *a c h*, draw the lines 5 *g* 5, 4 *k* 4, 3 *l* 3, &c. for the hour-lines of five, four, three, &c. The ſtyle in this caſe will be repreſented by the plane H 9 9 A, or D G F E, whoſe upper edge G F produced will paſs through the pole of the world (as it ought by Definition II.)

For the dial being placed in its proper poſition, the plane thereof will coincide with the meridian (by Definition VII.) and the line B A with the horizon; whence, the angle B A C being equal to the propoſed elevation of the pole by conſtruction, the line A C H will, it is evident, point directly to the ſaid pole, and therefore be parallel to the earth's axis. Therefore G F being parallel to A H, it muſt alſo be parallel to the earth's axis.

Note, An erect weſt dial for a north latitude, is conſtructed exactly in the ſame manner as an erect eaſt dial, provided that, inſtead of beginning the conſtruction from the right end B of the plane, you begin at the left end A, and that the figures expreſſing the hours of one, two, three, &c. in the afternoon be placed between the ſaid left end and the hour-line of ſix.

The ſame may be obſerved with regard to an erect eaſt dial for any ſouth latitude.

Problem V. To deſcribe a direct eaſt reclining dial, geometrically, for any north latitude; or a direct weſt reclining dial for any ſouth latitude.

Conſtruction, On the propoſed plane draw the right line I K 12, (*fig.* 4.) for the north and ſouth line of the dial, or the hour-line of twelve, perpendicular to which draw K C: make E C K equal to the given reclination, and perpendicular to K C draw C E L; take K M = K E and make the angle A M K equal to the complement of the propoſed latitude; join A C, and perpendicular thereto draw G C H, in which ſet off C *c* equal to the propoſed thickneſs of your ſtyle; through *c* draw *c a* perpendicular to G H, and let A *a* be parallel thereto: make C B = C E, and joining A B, and K B, draw C D perpendicular to A B; in A C and *a c*, produced, take C F and *c f*, each equal to C D, and from F, to the point where G H interſects I K, draw F 12; then make the angles 12 F 11, 11 F 10, 10 F 9, 9 F 8, each equal to 15°, and the angle *c f* 7 equal to the exceſs of 15° above the angle C F 8: alſo make the angles 7 *f* 6, 6 *f* 5, &c. each equal to 15°, and draw the right lines A 11, A 10, A 9, &c. for the hour-lines of 11, 10, 9, &c.

To ſhew that the upper edge of the ſtyle, when the dial is placed in its proper poſition, will be parallel to the earth's axis (as it ought to be by Definition II.) we may obſerve in the firſt place, that the plane of the triangle K E C, when erected perpendicular to the plane of the dial on the line K C, will be parallel to the prime vertical (by Definition X.) and perpendicular to the line I K, which, being the north and ſouth line of the dial, is parallel to the planes of the horizon and of the meridian, and therefore, becauſe the angle E K C expreſſes the reclination of the plane of the dial from the plane of the meridian, the line E K will be perpendicular to the plane of the horizon, and parallel to the plane of the meridian.

Now the triangles K E C, K B C, having the ſide E C = B C, K C common, and the angles E C K, B C K both right, will be equal and ſimilar; therefore when the plane of the ſtyle, repreſented by the triangle A C B, and the plane of the triangle K B C are erected perpendicular to the plane of the dial, on the lines A C, K C reſpectively, the triangle A K B, as the triangles K E C, K B C then coincide, will be parallel to the plane of the meridian. Moreover, becauſe B K (= K E) = K M, A K common, and the angles A K M, A K B both right, the triangles A K M, A K B will be equal and ſimilar, and therefore A B K = A M K = the complement of the given latitude by conſtruction; conſequently, the angle K A B being equal to the given latitude, the upper edge of the ſtyle A B, when produced, will paſs through the pole of the world, and ſo be parallel to the earth's axis.

If it be required to describe a west reclining dial for a north latitude, or an east reclining one for a south latitude, the method of construction will still be the same; provided that, instead of beginning the operation towards the right end of the line IK, you begin towards the left end, and that the figures expressing the hours after noon be placed, instead of those expressing the hours before noon.

A direct west inclining dial, for a north latitude, is constructed in the same manner as a direct east reclining one, only that the points A and C change their position (A being placed, in this case, at the left end of the line LC, and C at the right end of the line IK) and that (the sun not coming on the plane till after noon) the figures expressing the hours after noon be placed instead of those before noon.

The same may be observed with regard to a direct east inclining dial for a south latitude.

Problem VI. To describe an erect south dial, geometrically, for any proposed north latitude, to have a given declination from west; or an erect north dial, for a south latitude, to decline from the east.

Construction. On the proposed plane draw the right line BC, (*fig.* 5.) for the horizontal line of the dial, and perpendicular thereto draw BA; make the angle BCA equal to the proposed latitude, and the angle CBD equal to the complement of the given declination; then, having taken BD equal to BC, draw DE perpendicular to BC: join AE, and perpendicular thereto draw *f*E*g*, in which set off E*e* equal to the proposed thickness of your style; through *e* draw *ea* perpendicular to *fg*, and let A*a* be parallel thereto: make EF equal to ED, and joining AF, draw EG perpendicular thereto; in AE and *ae* produced take EH and *eh* each equal to EG, and from H to the point where *fg* intersects AB, produced, draw H12; then make the angles 12H11, 11H10, 10H9, each equal to 15 degrees, and the angle *eh*8 equal to the excess of 15 degrees above the angle EH9: also make the angles 8*h*7, 7*h*6, 6*h*5, &c. each equal to 15 degrees, and draw the right lines A11, A10, A9, *a*8, *a*7, &c. for the hour-lines of 11, 10, 9, 8, &c.

To demonstrate that the upper edge of the style, when the dial is placed in its proper position, will be parallel to the earth's axis (as it ought to be by Definition II.) it may be observed that the line BC being parallel to the plane of the horizon, the line AB perpendicular thereto, as the dial is an erect one, will be perpendicular to the said plane; therefore the plane of the triangle BDE, when erected perpendicular to the plane of the dial, on the line BE, being perpendicular to the line AB, and parallel to the plane of the horizon, the line BD will be perpendicular to the plane of the prime vertical (because the angle DBE expresses the complement of the plane's declination from the said plane, by Definition XII.) and consequently parallel to the plane of the meridian; therefore the plane ADB, being also perpendicular to the plane of the prime vertical, must coincide with the plane of the meridian.

Moreover, since DB is equal to BC (by Construction) the angles ABD and ABC both right ones, and AB common, it is evident, that the angle ADB is equal to the angle ACB, equal to the given latitude, and consequently that the line DA will be parallel to the earth's axis.

But the triangle AEF, when the plane of the style, represented by the triangle AFE, is erected perpendicular to that of the dial, on the substyle AE, will coincide with the triangle ADE, because DE is equal to FE, AE common, and the angles AFE, AED both right.

If it be required to describe an erect south dial for a northern latitude, to decline westerly, or an erect north dial for a southern latitude, to decline easterly; the method of construction will still be the same, only, instead of beginning the operation on the left side of AB, you must begin on the right side.

If the plane of an erect south dial, declining easterly, in a northern latitude, be inverted, the dial will then become an erect north dial, declining westerly, for the same latitude; and if the plane of an erect north dial declining westerly, in a southern latitude, be inverted, the dial will then become an erect south dial, declining easterly, for the same latitude.

In like manner, an erect south dial, declining westerly, in a northern latitude, will become an erect north dial declining easterly; and an erect north dial, declining easterly, in a southern latitude, will become an erect south dial, declining westerly.

If the declination be very great, so that the elevation of the style, above the substyle, becomes very small, the preceding method of construction will be impracticable; because the hour-lines, particularly those which fall near the substyle, unless they be continued to a great distance from the center of the dial, nearly coincide: which inconvenience may be removed by the following manner of construction.

Having drawn the style AF and the substyle AE, as is taught above, let the line EG, (*fig.* 6.) be drawn perpendicular to AF, and in AE continued, let EH be taken equal to EG; then, having drawn *f*E*g* perpendicular to AE, produce AB to meet *fg* in *g*, and join H*g*. Moreover, at a convenient distance, let the line CD be drawn parallel to AE, for a new substyle, and the lines LM, PQ, at as great a distance from each other as room will permit, perpendicular thereto; also from the points IN, where the lines LM, PQ intersect CD, let IK, NR be drawn perpendicular to AF.

Make

Make I S equal to I K and N O equal to N R; alſo make the angles I S M, N O Q each equal to the angle E H *g*; then, if the angles Q O 11, M S 11, 11 O 10, 11 S 10, 11 O 9, 10 S 9, &c. be each made equal to 15 degrees, lines drawn through the points M, 11, 10, 9, &c. Q, 11, 10, 9, &c. reſpectively, will be the hour-lines of the dial.

For, if from T, the point where F A and D C continued, meet, a line be drawn through M to meet P Q in 12, the triangles T I K, T N R, and T I M, T N 12, will be reſpectively ſimilar; and therefore I M : N 12 :: I K : N R :: I S : N O: But I M : N Q : : I S : N O, by conſtruction, therefore N 12 = N Q, conſequently the line Q M, continued, will paſs through T. In like manner it may be proved that the other hour-lines will paſs through T, the center of the dial; the ſtyle being here repreſented by the trapezium I *v w* N.

Problem VII. To deſcribe an eaſt declining dial, geometrically, for any propoſed northern latitude, to have a given reclination from the ſouth; or a weſt declining dial, for a ſouthern latitude, to have a given reclination from the north.

Conſtruction. Having drawn the ſtyle A F and the ſubſtyle A E (*fig.* 7.) anſwering to the given declination, according to problem vi. complete the parallelogram A B E K, and in B E produced take E H = E F = E D; alſo join K, H and make the angle E K L equal to the given reclination. On K L, produced, let fall the perpendicular H M and taking E O equal to E L, draw O I, parallel to E B, interſecting B D in Q.

On the propoſed plane (*fig.* 8.) draw S X T for the horizontal line, in which ſet off S T = B E and T X = O Q; alſo, perpendicular to S T, draw S R and T W equal to K L and L M reſpectively: draw R W for your ſubſtyle, perpendicular to which draw *f* W *g* and in it ſet off W Y (= H M) for the altitude of your ſtile, and W *w* for its thickneſs; alſo draw *w r* perpendicular and R *r* parallel to *f g*. In R W and *r w* produced take W *a* and *w b* each equal to W Z, perpendicular to R Y, and through X draw R X 12 meeting *f g* in 12; join *a*, 12 then make the angles 12 *a* 11, 11 *a* 10 each equal to 15 degrees, and the angle *w b* 9 equal to the exceſs of 15 degrees above the angle W *a* 10. Alſo make the angles 9 *b* 8, 8 *b* 7, &c. each equal to 15 degrees, then right-lines drawn from R to 11, 10, 1, 2, and from *r* to 9, 8, 7, 6 will be the hour-lines of 11, 10, 1, 2, 9, &c.

In order to ſhew that the upper edge of the ſtyle, when the dial is placed in its proper poſition, will be parallel to the earth's axis (as it ought to be by definition 2) it has been already proved, in the preceding problem, that when the plane A B E K (*fig.* 1.) is perpendicular to the plane of the horizon, the ſtyle F A is parallel to the earth's axis, in which caſe (the planes K E H, A E F and E B D being all perpendicular to the plane A B E K) the lines E D, E H and E F coincide, and conſequently expreſs the altitude of the point F, of the ſtyle, above the plane A B E K. Now, as the angle E K L expreſſes the given reclination or the inclination of the propoſed plane to the vertical plane, if the lines A H, A M be drawn, H M will expreſs the altitude of the point F above the plane A K M and A H will coincide with A F and ſo be parallel to the earth's axis. But as S R (*fig.* 2.) is by conſtruction equal to K L, if the parallelogram S V be completed, V W will be = K M the triangle R V W equal and ſimilar to the triangle A K M, and the triangle R W Y equal and ſimilar to the triangle A M H; conſequently when the plane of the ſtyle, repreſented by the triangle R W Y, is erected perpendicular to the plane of the dial on the line R W, the upper edge (R Y) thereof will paſs through the pole of the world, and ſo be parallel to the earth's axis.

If the dial be conſtructed for a northern latitude and E L be greater than E H, or, which is the ſame thing, K L greater than K M, the north pole will be elevated and the point W, in the ſubſtyle R W, will fall on the contrary ſide of R.

If it be required to deſcribe a reclining ſouth dial, for a northern latitude, to decline weſterly; or a reclining north dial, for a ſouthern latitude, to decline eaſterly; the method of conſtruction will ſtill be the ſame, only, inſtead of beginning the operation on the left ſide of A B and R S, you muſt begin on the right ſide of them.

In deſcribing a reclining north dial, for a north latitude, to decline eaſterly; or a reclining ſouth dial, for a ſouthern latitude to decline weſterly; the conſtruction differs from the former, inſomuch that the points A, B, E and K change the poſition and fall in the places of E, K, A and B reſpectively, and that the line K L falls on the contrary ſide of K E, with reſpect to the line K H; alſo that the points R, S, T and V fall in the places of T, V, R and S reſpectively, and that the hour-lines of 1, 2 become thoſe of 11, 10, and thoſe of 11, 10, 9, &c. become the hour-lines of 1, 2, 3, &c.

If the plane of a reclining ſouth dial, declining eaſterly, in a northern latitude, be inverted; the dial will then become an inclining north dial, declining weſterly, for the ſame latitude; but the morning hour-lines in the reclining dial will become the afternoon hour-lines in the inclining one. In like manner, a reclining north dial, declining weſterly, in a ſouthern latitude, will become an inclining ſouth dial, declining eaſterly, for the ſame latitude. Alſo a reclining ſouth dial, declining weſterly, in a northern latitude, will become an inclining north dial, declining eaſterly, for the ſame latitude; and a reclining north dial, declining eaſterly, in a ſouthern latitude, will become an inclining ſouth dial, declining weſterly, for the ſame latitude.

latitude. Moreover, a reclining north dial, declining eaſterly, in a northern latitude, will become an inclining ſouth dial, declining weſterly, for the ſame latitude; and a reclining ſouth dial, declining weſterly, in a ſouthern latitude, will become an inclining north dial, declining eaſterly, for the ſame latitude.

Having now given the conſtruction of the various kinds of dials, whether erect, declining, reclining, or inclining, we ſhall here put down the general demonſtration of the method, all along uſed, in drawing of the hour-lines, which we promiſed in our firſt problem, and thought would be better than taking up room with the particular demonſtration of each problem, as they all depend upon the ſame principle.

Let AE (*fig.* 9.) be the ſubſtyle, AF the ſtyle, A 12 the meridian line, and AG any other hour-line at pleaſure; making (as is every where done) EH perpendicular to AF and E*b* = EH; alſo let *b*G and GH be drawn.

Becauſe the ſun, in his apparent diurnal revolution, deſcribes an angle of 15° each hour about the axis of the earth, or the ſtyle AF of the dial, which is parallel to it, it is evident that if a plane, coinciding with (or lying upon) the line AF, be ſuppoſed to revolve about the ſame as an axis, at the rate of 15° *per* hour, it will when produced paſs through the ſun, and conſequently its interſection with the plane of the dial will mark out the true poſition of the hour-lines.

Now it is known that the angle included between any two planes is equal to (or meaſured by) the angle made by two lines in thoſe planes perpendicular to their common interſection: alſo, by the general method all along uſed, the angle E*b*G is equal to the given hour-angle betwixt the time of the planes falling upon the ſubſtyle and the propoſed hour-line AG: but the line HG is perpendicular to the axis AF, becauſe the plane GHE, being perpendicular to the plane of the ſtyle EFA, all the lines in that plane (and conſequently HG) will be perpendicular to AF. Moreover, the triangles EHG, E*b*G having EH = E*b*, EG common, and the angles HEG and *b*EG both right, are equal in all reſpects, and conſequently the angle GHE, meaſuring the inclination of the plane betwixt the times of its falling on the ſubſtyle and the hour-line AG, will be equal to the angle G*b*E = the ſaid hour angle by conſtruction.

The above curious track was written by the late celebrated Mr. T. Simpſon, of Woolwich, and publiſhed ſometime ago in a periodical work called Mathematical Exerciſes; but as that book is in very few hands, and not now to be had, we dare ſay it will here be an acceptable preſent to the public, and we need not be aſhamed to acknowledge that it was not in our power to have ſaid any thing better on the ſubject.

DIALECT, διαλεκτος, an appellation given to the language of a province, in ſo far as it differs from that of the whole kingdom. The term, however, is more particularly uſed in ſpeaking of the ancient Greek, whereof there were four dialects, the Attic, Ionic, Æolic, and Doric, each of which was a perfect language in its kind, that took place in certain countries, and had peculiar beauties.

In Great-Britain, beſides the grand diverſity of Engliſh and Scotch, almoſt every county has a dialect of its own, and differing conſiderably in pronunciation, accent, and tone, although one and the ſame language.

DIALECTICS, *Dialectica*, in the literary hiſtory of the ancients, that branch of logics which taught the rules and modes of reaſoning. See LOGIC.

DIALING, the art of conſtructing all manner of dials.

The antiquity of dials is beyond all doubt very great: ſome attribute their invention to Anaximenes Mileſius, and others to Thales: Vitruvius mentions one made by the ancient Chaldean Beroſus, on a reclining plane, almoſt parallel to the equinoctial. Ariſtarchus Samius invented the hemiſpherical dial: and there were at the ſame time ſome ſpherical ones with a needle for the gnomon. The diſcus of Ariſtarchus was an horizontal dial, with its limb raiſed up all round, to prevent the ſhadow from ſtretching out too far.

It was very late before the Romans knew any thing of dialing: Papyrius Curſon ſet up the firſt ſun-dial at Rome, about the year of the city 460; before which time, ſays Pliny, they had no account of time, but the ſun's riſing and ſetting. This dial muſt have been but a very indifferent one; for ſo ignorant were they of the principles of dialing in the conſulſhip of M. Valerius Meſſalla, which was ſome time after this that he ſet up a dial at Rome, which he brought from a port of Sicily, whoſe latitude was ſeveral degrees different from that of Rome.

Dials ſeem to have been in uſe much ſooner amongſt the eaſtern nations, eſpecially the Jews; for we read of the dial of Ahaz, who, according to the beſt chronologiſts, began to reign within twelve years after the building of Rome.

The firſt profeſſed writer on dialing that we know of is Clavius, who demonſtrates both the theoretical and practical parts of it after the rigid method of the ancients. After him Dechales, Ozanam, Picard, Walkerius, and De la Hire have handled this ſubject, and made great improvements in it. Their works, together with ſome conſiderable additions, have been republiſhed by Sturmius, Coetſia, and Bion, and have been tranſlated into our own language by ſeveral hands.

But dialing ſeems to have received its greateſt improvements from our own countrymen, Gunter, Wright, Foſter, Collins, Molyneux, and others.

DIALING-GLOBE, an inſtrument of braſs or wood, with a plane fitted to the horizon, and an index, ſo contrived as to give a clear illuſtration of the principles on which dials are made.

DIALING-LINES, or SCALES, are graduated lines placed on rulers, or the edges of quadrants and other inſtruments, to expedite the conſtruction of dials. Theſe are, 1. A ſcale of ſix hours, which is only a double tangent, or two lines of tangents, each of 45°, ſet together in the middle, and equal to the whole line of ſines, with the declination ſet againſt the meridian altitudes in the altitude of the place. 2. A line of latitudes, which is fitted to the hour-ſcale, and is made by this canon. As the radius: to the chord of 90° :: ſo are the tangents of each reſpective degree of the line of latitudes: to the tangents of other arches; and then the natural ſines of theſe arches are the numbers which, taken from a diagonal ſcale of equal parts, ſhall graduate the diviſions of the line of latitudes to any radius. The lines of hours and latitudes are, in general, for pricking down all dials with centers.

The other ſcales are particular, and give the ſeveral requiſites for all upright declining dials by inſpection. They are, 1. A line of chords. 2. A line for the ſub-ſtyle's diſtance from the meridian. 3. A line for the ſtyle's height. 4. A line of the angle of 12 and 6. 5. A line of inclination of meridians.

DIALING-SPHERE, an inſtrument made of braſs, with ſeveral ſemi-circles ſliding over each other upon a moveable horizon; ſerving to demonſtrate the nature of ſpherical triangles, as well as to give the true idea of drawing dials on all ſorts of planes.

DIALING, among miners, the ſame with plumming. See the article PLUMMING.

DIALOGISM, διαλογισμος, in rhetoric, is uſed for the ſoliloquy of perſons deliberating with themſelves, as the following of Juno, in the firſt Æneid of Virgil:

——*mene incepto deſiſtere victam?*
Nec poſſe Italia Teucrorum avertere regem?
Quippe vetor fatis? &c.

In this ſenſe it is diſtinguiſhed from dialogue.

DIALOGUE, in matters of literature, a converſation between two or more perſons, either by writing or by word of mouth.

The word is formed from the Greek, δια, together, and λογος, a diſcourſe.

DIALYSIS, in grammar, a mark or character, conſiſting of two points, ··, placed over two vowels of a word, in order to ſeparate them, becauſe otherwiſe they would make a diphthong, as Moſaic, &c. See the article DIÆRESIS.

DIAMETER *of a Circle*, in geometry, is a right-line paſſing through the center, and terminating both ways in the circumference. See the article CIRCLE.

DIAMETER *of a Curve*, in the higher geometry, is a line, either right, or curved, which biſects all parallels drawn from one point of the curve to another.

DIAMETER *of a Sphere*, is the diameter of the ſemi-circle, by whoſe rotation the ſphere is generated; in which ſenſe it is the ſame with axis. See the article AXIS.

DIAMETERS *of the heavenly Bodies*, in aſtronomy, are different, according to different authors; owing either to the different degrees of perfection in the inſtrument made uſe of, or elſe to the different degrees of accuracy in the obſervers, or perhaps to both: we ſhall give the quantities of ſuch of them as have come to our knowledge.

Object.	Obſerver.	Greateſt diameter	Leaſt diameter
		′ ″	′ ″
Sun	Ptolemy	33.20.0	31.20.0
	Tycho	32. 0.0	30. 0.0
	Kepler	31. 4.0	30. 0.0
	Caſſini	32.10.0	31. 8.0
	De la Hire	32.43.0	31.38.0
	Hally	32.43.0	31.38.0
	De la Caille	32.39.2	31.34.4
	Mayer	32.38.6	31.33.8
Moon	Ptolemy	35.20.0	31.20.0
	Tycho conjunction	28.48.0	25.36.0
	Tycho oppoſition	36. 0.0	32. 0.0
	Kepler	32.44.0	30. 0.0
	De la Hire	33.30.0	26.30.0
	Hally	33.36.0	29.25.0
	Mayer	33.36.5	28.54.2
	Bradley	33.40.0	29. 0.5
Saturn	Tycho	2.12.0	1.34.0
	Hevelius	0.19.0	0.14.0
	Huygens	0. 0.0	0. 0.0
Jupiter	Tycho	3.59.0	2.14.0
	Hevelius	0.24.0	0.14.0
	Huygens	0. 0.0	1. 4.0
Mars	Tycho	6.46.0	0.57.0
	Hevelius	0.20.0	0. 2.0
	Huygens	0. 0.0	0.30.0
Venus	Tycho	4.40.0	1.52.0
	Hevelius	1. 5.0	0. 9.0
	Huygens	0. 0.0	1.25.0
Mercury	Tycho	3.57.0	1.29.0
	Hevelius	0.11.0	0. 4.0

It must be noted, that Tycho made all his observations with the naked eye, which makes his differ so much from the others.

DIAMETER *of a Column*, in architecture, is its thickness just above the base. See COLUMN.

From this the module is taken, which measures all the other parts of a column. See the article MODULE.

DIAMOND, *Adamas*, in natural history, a stone which, though naturally colourless like the purest water, is eminently distinguished from all others of the colourless kind by the lustre of its reflections.

It is found sometimes in an angular, and sometimes in a pebble-like form. In its angular state however it does not, like the rest, resemble the common spring crystal, but the more perfect bodies of that class, the double-pointed ones.

The true figure of the diamond in its angular, that is, its more perfect form, is an inequilateral octahedron, composed of two quadrilateral pyramids affixed base to base, and consequently their points turned the opposite way; these the jewellers call six-pointed stones: but besides this, there are two other less perfect angular figures, a columnar one of six sides, and an oblong quadrilateral column with two truncated ends; besides, there is an almost infinite variety of others, cornered and pointed, but which properly belong to it in its pebble form. In this state it is sometimes roundish, sometimes oblong, and sometimes flat, and in some specimens perfectly smooth, in others full of inequalities on the surface.

In whichsoever of these forms the diamond is found, it is the same stone, and when polished has the same qualities in proportion to its perfection and purity.

The diamond, like all other transparent fossils, is liable to be tinged by metalline particles, and is sometimes found with a cast of red, sometimes blue, sometimes green, and more frequently yellow. The small diamonds are vastly the more plentiful, the others are found more and more rarely as they increase in size. The largest ever certainly known is now in the possession of the Great Mogul; its weight is 279 carats, and its value is computed at between seven and eight hundred thousand pounds.

As diamonds have originally, without all question, being concreted out of a fluid, it is not at all surprising, that among the various accidents such a concretion must have been attended within the bowels of the earth; some parts of the matter should have shot into quadrangular pyramids, while other parts of it form themselves into hexangular, pyramidal, or pebble-like concretions.

The diamond in its native state is sometimes bright as if polished by art, but more frequently its surface is observed with foulnesses of various kinds; and sometimes it is, as the diamond-cutters call it, veiny, that is, it has certain points inconceivably hard on its surface.

The diamond bears the force of the strongest fire unhurt, if ever so long continued in it, provided be not removed too suddenly into the cool air, when it will sometimes crack. Exposed to the solar rays collected in the focus of a large lens, it after some time splits into several very thin flakes, like those of talc, and these soon after run into a kind of glass, which has nothing of the hardness or lustre of the diamond.

The places whence we have the diamonds are the East-Indies, in the island of Borneo, and in the kingdom of Visapour, Golconda, Bengal; and the Brasils in the West-Indies.

The diamond, as has been observed, is the hardest of all precious stones; it can only be cut and ground by itself, and its own substance.

To bring it to that perfection which augments its price so considerably, they begin by rubbing two stones against each other, while rough, after having well cemented them to the ends of two sticks, or blocks, called cutting sticks, thick enough to be held in the hand. It is this powder thus rubbed off the stone, and received in a little box for that purpose, called the cutting-box, which serves to grind and polish the stones.

Diamonds are cut and polished by means of a mill, which turns a wheel of cast iron, sprinkled over with diamond dust, mixed with oil of olives.

The same dust, well ground and diluted with water and vinegar, is used in the sawing of diamonds, which is performed with an iron or brass wire as fine as a hair.

Sometimes, instead of sawing the diamonds, they cleave them, especially if there be any small shivers in them; but the Europeans rarely run the risque of cleaving, for fear of breaking them.

A rough diamond ought to be chosen uniform, of a good shape, transparent, not quite white, and free from flaws and shivers.

Shivers are caused in diamonds by this, that the miners, to get them more easily out of the vein, which winds between two rocks, break the rocks with huge iron levers, which shakes and fills the stone with shivers.

The ancients had two mistaken notions as to the diamond; the first is, that it becomes soft, by steeping it in hot goat's blood; and the second, that it is malleable, and bears the hammer; but however, experience has shewn the contrary, there being nothing capable of mollifying the hardness of the stone; and its hardness is such, that it will endure being struck at pleasure with the hammer.

The finest diamonds now in the world are that of the Great Mogul, weighing 279 carats, as has been already observed; that of the great duke of Tuscany, weighing 139 carats; and that known in France by the name of grand fancy, which is one of the crown jewels,

jewels, weighing 106 carrats; whence comes its name ſancy, which is a corruption of cent. ſix; that is, 106.

Valuation of DIAMONDS, among jewellers, is thus calculated: they ſuppoſe the value of a rough diamond to be 2 *l.* per carat; then to find the value of thoſe of greater weight, they multiply the ſquare of their weight by 2, and this laſt product is the value of the diamonds in their rough ſtate: thus, the value of a rough diamond, weighing 4 carats, is equal $4 \times 4 \times 2 = 16 \times 2 = 32$ *l.* and ſo in other caſes.

Again, to find the value of wrought diamonds, they ſuppoſe half their weight loſt in the manufacturing them, and therefore multiply the ſquare of double their weight by 2: thus the value of a wrought diamond, weighing 3 carats, is equal $6 \times 6 \times 2 = 36 \times 2 = 72$ *l.*

Corniſh DIAMOND, in natural hiſtory, a name given to a kind of cryſtals, from their being found in Cornwall.

Rough DIAMOND, is the ſtone as nature produces it in the mines.

Roſe DIAMOND, is that quite flat underneath, with its upper-part cut in divers little faces, uſually triangles, the uppermoſt of which terminate in a point.

Table DIAMOND, is that which has a large ſquare face at top, encompaſſed with four leſſer.

Brilliant DIAMOND, is that cut in faces, both at top and bottom; and whoſe table, or principal face at top, is flat.

DIAMOND, in the glaſs trade, an inſtrument uſed for ſquaring the large plates or pieces; and among glaziers, for cutting their glaſs.

Theſe ſort of diamonds are differently fitted up; thoſe uſed for cutting looking-glaſs, &c. are called plough-diamonds, fitted into a kind of plane; and thoſe made uſe of by glaziers, are ſet in an iron ferril, about two inches long, and a quarter of an inch or ſomewhat more, in diameter; and in which is a handle of box, ebony, &c. fitted to the ferril, for holding it by.

DIAMOND, in Heraldry, a term uſed for expreſſing the black colour in the atchievements of peerage.

Guillim does not approve of blazoning the coats of peers by precious ſtones inſtead of metals and colours; but the Engliſh practice allows it. Morgan ſays the diamond is the emblem of fortitude.

DIAMORUM, in pharmacy, a preparation of mulberries and honey, uſed againſt diſeaſes of the throat, and for ſtopping dyſenteries, &c.

DIANÆ ARBOR, or ARBOR LUNÆ, in chemiſtry, the beautiful cryſtallizations of ſilver, diſſolved in aquafortis, to which ſome quickſilver is added; and ſo called from their reſembling the trunk, branches, leaves, &c. of a tree.

DIANDRIA, the name of the ſecond claſs in the Linæan ſyſtem of botany, and comprehends all ſuch plants as bear hermaphrodite flowers, furniſhed with two ſtamina in each; of this claſs are the jaſmine, phillyrea, lilac, olive, ſage, roſemary, with ſeveral other genera.

DIANTHERA, in botany, a genus of plants whoſe corolla conſiſts of a ſingle ringent petal with two filaments toped with twin antheræ; the fruit is a bivalvular capſule, with two cells, each containing a ſolitary lentiform ſeed.

DIANTHUS, in botany, a name given by Linnæus to the caryophyllus of other botaniſts, and comprehends the pink, carnation, clove july-flower, and ſweet-william. See the articles PINK, CARNATION, &c.

DIAPASMA, in pharmacy, a name for all powders ſprinkled on the body, whether as perfumes or otherwiſe. See the article CATAPASMA.

DIAPASON, in muſic, a muſical interval, by which moſt authors, who have wrote upon the theory of muſic, uſe to expreſs the octave of the Greeks. See OCTAVE.

DIAPASON, among the muſical inſtrument-makers, a kind of rule or ſcale, whereby they adjuſt the pipes of their organs, and cut the holes in their flutes, hautboys, &c. in due proportion, for performing the tones, ſemi-tones, and concords juſt.

A ſquare being divided into eight parallelograms, the points wherein a diagonal line interſects all theſe parallelograms, expreſs all the uſual intervals in muſic: and on this principle it is that the diapaſon is founded. There is a particular kind of diapaſon for trumpets, ſerving as a ſtandard of the different magnitudes they muſt have to perform the four parts of muſic. See the article TRUMPET.

There is another for ſackbuts, ſhewing how far they are to be lengthened and ſhortened, to raiſe or fall from one tone to another.

The bell-founders have likewiſe a diapaſon, ſerving to regulate the ſize, thickneſs, weight, &c. of their bells.

DIAPASON DIAEX, in muſic, a kind of compound concord, whereof there are two ſorts; the greater, which is in the proportion of 10: 3; and the leſſer, in that of 16: 5.

DIAPASON DIAPENTE, in muſic, a compound conſonance in a triple ratio, as 3: 9. This interval, ſays Martianus Capella, conſiſts of nine tones and a ſemi-tone, nineteen ſemi-tones, and thirty-eight dieſes. It is a ſymphony made when the voice proceeds from the firſt to the twelfth ſound.

DIAPASON DIATESSARON, in muſic, a compound concord, founded on the proportion of 8: 3. To this interval Martianus Capella allows eight tones and a ſemi-tone, ſeventeen ſemi-tones, and thirty-four dieſes.

This

This is when the voice proceeds from its firſt to its eleventh ſound. The moderns would rather call it the eleventh.

DIAPASON DITONE, in muſic, a compound concord, whoſe terms are as 10:4, or 5:2.

DIAPASON SEMIDITONE, in muſic, a compound concord, whoſe terms are in the proportion of 12:5.

DIAPEDESIS, in medicine, a tranſudation of the fluids through the ſides of the veſſels that contain them, occaſioned by the blood's becoming too much attenuated, or the pores becoming too patent.

DIAPENSIA, in botany, a genus of plants, whoſe flower conſiſts of a monopetalous hypocrateriform corolla, with five ſtamina. The fruit is a trilocular roundiſh capſule, incloſing a great number of roundiſh ſeeds.

DIAPENTE, in the ancient muſic, an interval marking the ſecond of the concords; and with the diateſſaron, an octave.

This is what, in the modern muſic, is called a fifth.

DIAPENTE COL DITANO, in muſic, is, by Zarlin, and many others, uſed for what we call the ſeventh major. See the article SEVENTH.

DIAPENTE COL SEMIDITANO, in muſic, is the ſeventh minor. See the articles MINOR and MAJOR.

DIAPENTE, in pharmacy, is uſed for a medicine compounded of five ſeveral drugs or ingredients.

DIAPERED, or DIAPRE, in heraldry, the dividing of a field in planes, like fret-work, and filling the ſame with variety of figures. This chiefly obtains on bordures, which are diapered or fretted over, and the frets charged with things proper for bordures. Baron renders it *variatus*, which is not ſufficient to expreſs the ſeveral things of which it is variated.

DIAPHANOUS, an appellation given to all tranſparent bodies, or ſuch as tranſmit the rays of light; a quality which, according to the Carteſians, is owing to the rectitude or ſtraightneſs of their pores; but, according to Sir Iſaac Newton, to the homogeneity of the ſubſtance of theſe bodies, and of the medium which occupies their pores.

DIAPHOENICUM, in pharmacy, a ſort of medicine or electuary, chiefly made of dates. It purges ſeroſities, and excites the menſes. It is alſo uſed in dropſies, lethargies, apoplexies, and palſies.

DIAPHORESIS, διαφορησις, in medicine, an elimination of the humours in any part of the body through the pores of the ſkin. See the article PERSPIRATION.

DIAPHORETICS, among phyſicians, all medicines which promote perſpiration. See the article ALEXIPHARMIC.

DIAPHRAGM, in anatomy, the part which ſeparates the thorax from the abdomen; vulgarly called the midriff.

The word is derived from the Greek, διαφρασσω, to incloſe or wall in.

It is alſo called ſeptum tranſverſum, or croſs-wall, from its ſituation, becauſe it divides the trunk of the body into two cavities, the thorax and abdomen. It is compoſed of two muſcles; the firſt and ſuperior of theſe ariſes from the ſternum, and the ends of the laſt ribs, in each ſide. Its fibres, from this ſemi-circular origination, tend towards their center, and terminate in a tendon, or aponeuroſis, which hath always been taken for the nervous part of the midriff. The ſecond and inferior muſcle comes from the vertebræ of the loins by two productions, of which that on the right-ſide comes from the firſt, ſecond, and third vertebræ of the loins; that on the left-ſide is ſomewhat ſhorter; and both theſe productions join and make the lower part of the midriff, which joins its tendon with the tendon of the other, ſo as that they make but one membrane, or rather partition. It is covered with a membrane on its upper-ſide, and by the peritonæum on the lower-ſide. It is pierced in the middle for the paſſage of the vena cava, in its lower-part for the œſophagus, and the nerves which go to the upper orifice of the ſtomach; and betwixt the productions of the inferior muſcle, paſſes the aorta, the thoracic duct, and the vena azygos. It receives arteries and veins called phrenicæ, from the cava and aorta; and ſometimes on its lower-part two branches from the vena adipoſa, and two arteries from the lumbares. It has two nerves which come from the third vertebræ of the neck, which paſs through the cavity of the thorax, and are diſperſed in the muſcles of the midriff. In its natural ſituation, it is convex on the upper-ſide towards the breaſt, and concave on its lower ſide towards the belly: therefore, when its fibres ſwell and contract, it muſt become plane on each ſide, and conſequently the cavity of the breaſt is enlarged to give liberty to the lungs to receive the air in inſpiration; and the ſtomach and inteſtines are preſſed for the diſtribution of the chyle: but it diminiſhes the cavity of the breaſt when it reſumes its natural ſituation, and preſſes the lungs for the expulſion of the air in exſpiration.

DIAPHORESIS, in rhetoric, a figure of oratory, expreſſing the uncertainty of the ſpeaker how he ſhall proceed in his diſcourſe.

DIARBEC, or DIARBECK, a province in Aſia, anſwering to the ancient Meſopotamia: it is ſituated on the river Tigris, near its ſource, in the 42d deg. eaſt long. and in the 37th deg. 30 min. north lat. It is alſo the capital of the ſame province.

DIARRHODON, in pharmacy, a name given to divers compoſitions in which roſes are the principal ingredient.

Dominic, a native of Spain, was approved of by Innocent III. in 1215, and confirmed by a bull of Honorius III. in 1216.

DOMINION, *Dominium*, in the civil law, fignifies the power to uſe or diſpoſe of a thing as we pleaſe.

DOMINUS, in the civil law, he who poſſeſſes any thing by right of purchaſe, gift, loan, legacy, inheritance, payment, contract, or ſentence.

DOMINUS, in the feudal law, he who grants a part of his eſtate in fee to be enjoyed by another.

DONATION, an act whereby a perſon transfers to another, either the property or the uſe of ſomething, as a free gift. In order to be valid, it ſuppoſes a capacity both in the donor and donee; and requires conſent, acceptance, and delivery; and by the French law, alſo regiſtry. Civilians diſtinguiſh donation into pure and conditional. *Donatio pura* is when one gives a thing with an intention that it become immediately the property of the donee, never to revert to the donor; and this from no other motive than his generoſity. *Donatio conditionalis* is when one gives a thing with an intention that it become the property of the donee, upon performing ſome condition ſtipulated.

DONATISTS, Chriſtian ſchiſmatics in Africa, who took their name from their leader Donatus.

DONATIVE, a gratuity, or preſent, made to any perſon.

DOOR, in architecture, an aperture in a wall to give entrance and exit into and out of a building, or any apartment thereof.

It is laid down as a rule, that the doors of an houſe be as few in number, and as moderate in dimenſions, as poſſible; as all openings are weakenings.

Secondly, That they do not approach too near the angles of the walls, it being a very great ſoleciſm to weaken that part which ſtrengthens all the reſt.

Thirdly, That the doors, if poſſible, be placed over one another, that void may be over void, and full over full, which circumſtance will greatly ſtrengthen the whole fabric.

Fourthly, That if poſſible they may be oppoſite to each other, in ſuch a manner, that one may ſee from one end of the houſe to the other, which will not only be very graceful, but moſt convenient, in reſpect that it affords means of cooling the houſe in ſummer, by letting the air through it, and by keeping out the wind in winter, which way ſoever it ſit.

Fifthly, It is not only ornamental, but very ſecure, to turn arches over doors, which will diſcharge them in a great meaſure from the ſuperincumbent weight.

The proportions of doors are adjuſted by thoſe of a man. In large buildings, they muſt be always larger than in ſmaller; but ſhould not be leſs than ſix feet high in any to admit a man of a juſt ſtature erect: and as the breadth of a man, with his arms placed akembo, is nearly ſubduple his height, the width ought never to be leſs than three feet. Some architects give us theſe dimenſions following; in ſmall buildings, the breadth of the door four feet, or four and a half; in the middling buildings five, or ſix; in large ones ſeven, or eight: in chambers of the firſt ſtory three and a half, three and three fourths, or four; of the ſecond, four, or four and a half; of the third, five, or ſix; in churches ſeven or eight; in gates, nine, ten, or twelve: hence their height is eaſily determined, except for the gates of cities, which ſhould only be four-fifths of their breadth.

DORADO, in ichthyology, the ſame with guaracapema. See GUARACAPEMA.

DOREE, or JOHN DOREE, a fiſh, called by authors faber. See the article FABER.

DORIC, in general, any thing belonging to the Dorians, an ancient people of Greece, inhabiting near Mount Parnaſſus.

DORIC ORDER, in architecture, the ſecond of the five orders, being that between the Tuſcan and Ionic.

This order ſeems the moſt natural and beſt proportioned of all the orders, the ſeveral parts of it being founded on the natural poſition of ſolid bodies. Accordingly, the Doric is the firſt, and moſt ancient of the orders of architecture, and is that which gave the firſt idea or notion of regular building.

It was indeed more ſimple at its firſt invention, than it is at preſent; and when they came in after times to adorn and enrich it more, the appellation of Doric was reſtrained to this richer manner, and then they called the primitive, ſimple manner by the new name of Tuſcan.

Some time after its invention it was reduced to the proportions, ſtrength, and beauty of the body of a man: hence, as the foot of a man was judged the ſixth part of his height, they made the Doric column ſix diameters high. After that, they added another diameter to it, and made it ſeven, which augmentation ſeemed to bring it nearer to the proportion of a man, the human foot, at leaſt in our days, not being a ſixth, but nearly a ſeventh part of the body.

The characters of the Doric order, as they are now managed, are, the height of its column, which is eight diameters; the frieze, which is adorned with triglyphs, drops, and metopes; its capital, which is without volutes, and its admitting of cymatiums.

It has been already obſerved, that the ancients had two Dorics; the firſt of which was the more ſimple and maſſive, and was chiefly uſed in temples; the ſecond, which was the more light and delicate, they uſed in porticos and theatres.

The Doric is uſed by the moderns, on account of its ſolidity, in large, ſtrong buildings, as in the

gates of cities and citadels, the outſides of churches, and other maſſy works, in which delicacy of ornaments would not be ſuitable.

The moſt conſiderable ancient monument of this order is the theatre of Marcellus at Rome, the capital, the height of the frieze, and projecture of which are much ſmaller than in the modern architecture.

Vignola adjuſts the proportion of the Doric order as follows: he divides the whole height of the order without the pedeſtal into twenty parts, or modules, one of which he allows to the baſe; fourteen to the ſhaft, or ſuſt; one to the capital; and four to the entablature: the ſeveral parts and members may be ſeen under their reſpective articles, COLUMN, CORNICHE, BASE, FRIEZE, &c.

DORIC DIALECT, in grammar, one of the five dialects, or manners of ſpeaking, which were principally in uſe among the Greeks.

It was firſt uſed by the Lacedemonians, particularly thoſe of Argos; afterwards it paſſed into Epirus, Lybia, Sicily, and the iſlands of Rhodes, Crete, &c.

DORIC MODE, in muſic, the firſt of the authentic modes of the ancients; its character is to be ſevere, tempered with gravity and joy; and is proper upon religious occaſions, as alſo to be uſed in war.

It begins D, *la, fol, re.* Plato admires the muſic of the Doric mode, and judges it proper to preſerve good manners, as being maſculine; and on this account allows it in his commwealth.

DORING, or DARING, among ſportſmen, a term uſed to expreſs a method of taking larks by means of a clap-net and looking-glaſs.

DORMANT, in heraldry, is uſed for the poſture of a lion, or any other beaſt, lying along in a ſleeping attitude, with the head on the fore-paws; by which it is diſtinguiſhed from the couchant, where though the beaſt be lying, yet he holds up his head.

DORMANT TREE, in architecture, ſignifies a window made in the roof of an houſe, or above the entablature, being raiſed upon the rafters.

DORMITORY, a gallery in convents or religious houſes, divided into ſeveral cells, in which the religious ſleep or lodge.

DORONICUM, leopard's bane, in botany, a genus of plants, producing compound, radiated flowers. The diſcous florets are hermaphrodite and funnel-ſhaped, and the rays are compoſed of ſeveral ligulated, ſpear-pointed female florets. Theſe are ſucceeded, each by a ſingle furrowed ſeed, covered with down, and contained in the calyx, which is ſlightly connivent.

The doronicum officinarum grows naturally in Hungary and Switzerland, the roots of which are ſaid to be an alexipharmic, and good againſt the bites of venemous creatures; but modern practice gives it little credit in any ſuch intentions, and is therefore much in diſuſe.

DORSAL, an appellation given to whatever belongs to the back. See DORSUM.

DORSAL MUSCLES are the muſcles of the back and loins, which are for the moſt part common: there are of the extenſors uſually reckoned three on each ſide, viz. the ſacrolumbaris, the longiſſimus dorſi, and the ſemiſpinoſus: the flexors are three alſo, viz. the quadratus lumborum, the pſoas parvus, and the intertranſverſales lumborum. See each under its proper head.

DORSAL NERVES. See NERVE.

DORSIFEROUS PLANTS, among botaniſts, ſuch as are of the capillary kind, without ſtalks, and which bear their ſeeds on the backſide of their leaves.

The word is formed from the Latin, *dorſum*, the back, and *fero*, to bear.

DORSTENIA, CONTRAYERVA, in botany, a genus of plants, which are deſtitute of a corolla; but the cup, which is a common involucrum, contains ſeveral quadrangular perianthiums, with four filiform ſtamina each.

The ſeeds, which are roundiſh and ſolitary, are contained in a common fleſhy receptacle. See the article CONTRAYERVA.

DORSUM, BACK, in anatomy, comprehends all the poſterior part of the trunk of the body, from the neck to the buttocks. The back is furniſhed with ſeveral muſcles, which are common to it with the loins, as the longiſſimus dorſi, the ſacro-lumbaris, and ſemiſpinoſus; theſe are called extenſors. See EXTENSOR.

To the back likewiſe belong the intertranſverſales lumborum, the quadratus lumborum, and the pſoas. See the article INTERTRANSVERSALES, &c.

Its bones are the ſpina dorſi, ribs, and os ſacrum. See SPINE, RIB, &c.

Dorſum is alſo uſed to denote the upper-ſide of the hand and foot, in contradiſtinction to the lower-ſide, called the palm and ſole. See HAND and FOOT.

DORSUM NASI, the ridge of the noſe. See NOSE.

DOSE, in medicine and pharmacy, the quantity of a medicine given at one time; or the proportion which the ſeveral ingredients of a compound medicine bear to each other.

DOSITHEANS, *Doſithei*, in church-hiſtory, a ſect among the Hebrews, being one of the branches of the Samaritans. See the article SAMARITANS.

DOSSER, in military matters, a ſort of baſket, carried on the ſhoulders of men, uſed in carrying the overplus earth from one part of a fortification to another, where it is wanted.

DOSSIL, in ſurgery, lint made into a cylindric form, or reſembling the ſhape of dates, or olive-ſtones, the ſize of which is very different. Doſſils are uſed in dreſſing a diſordered part, and are ſometimes ſecured by a thread, tied round their middle.

DOUBLE CAST, in huſbandry, a term uſed by the farmers for that method of ſowing that does not diſpenſe the neceſſary quantity of ſeed for a piece of land at one bout, but requires going over many places twice.

DOULE DESCANT, in muſic. See the article DESCANT.

DOUBLE *Horizontal Dial*, one with a double gnomon, one of which points out the hour on the outward circle, and the other ſhews the hour upon the ſtereographic projection drawn upon it. This dial not only finds the meridian, hour, &c. but ſhews the ſun's place, riſing and ſetting, declination, amplitude, altitude, and azimuth, with many other uſeful propoſitions.

DOUBLE FICHY, or FICHE, in heraldry, the denomination of a croſs, when the extremity has two points, in contradiſtinction to fiché, where the extremity is ſharpened away to one point.

DOUBLE LETTER, in grammar, a letter which has the force and effect of two. The Greeks have three of theſe, viz. Ζ, Ξ, Ψ; the Latins have two, X and Z; and moſt of the modern languages have the ſame.

DOUBLE PEDESTAL. See PEDESTAL.

DOUBLE PLEA, in law, is where the defendant in a ſuit alledges two ſeveral matters in bar of the plaintiff's action, when one of them is ſufficient. This is not admitted in common law. Thus when a perſon pleads ſeveral things, the one having no dependance upon the other, ſuch plea is accounted double, and will not be admitted; but where the things pleaded mutually depend on each other, and the party cannot have the laſt plea without the firſt, there the whole ſhall be received.

DOUBLE PLOUGH. See PLOUGH.

DOUBLE POINT, in the higher geometry. See CURVES *of the ſecond Order*.

DOUBLE POSITION. See POSITION.

DOUBLE QUARREL, a complaint made by any clerk, or other, to the archbiſhop of a province, againſt an inferior ordinary for delaying juſtice in ſome ſpiritual cauſe, as to give ſentence, inſtitute a clerk, or the like.

DOUBLE VESSEL, in chemiſtry, is when the neck of one bolt-head or mattraſs is put and well luted into the neck of another, in order to refine and exalt ſpirits as high as can be. It is ſometimes called a pelican, alſo a diota.

DOUBLET, among lapidaries, implies a counterfeit ſtone compoſed of two pieces of cryſtal, and ſometimes glaſs, faſtened together with proper colours between them, ſo as to appear the ſame to the eye, as if the whole ſubſtance of the cryſtal had been tinged with thoſe colours.

DOUBLING, in the military art, is the putting two ranks or files of ſoldiers into one.

DOUBLING, among hunters, who ſay that a hare doubles, when ſhe keeps in plain fields, and winds about to deceive the hounds.

DOUBLING, in the manege, a term uſed of a horſe, who is ſaid to double his reins, when he leaps ſeveral times together, to throw his rider: thus we ſay, the ramingue doubles his reins, and makes pontlevis.

DOUBLING, in navigation, the act of ſailing round a cape, point of land, &c. ſo as that the cape or point of land becomes between the ſhip and her former ſituation, or between any obſerver and the ſhip.

DOUBLING *upon*, in a ſea-fight, is when part of one fleet, either by having a greater number of ſhips, or by taking the advantage of the wind with a ſuperior ſkill, encloſes part of the enemy's fleet between two fires, ſo that they are attacked on both ſides; a circumſtance which expoſes them to the greateſt danger, and uſually throws them into confuſion. See ENGAGEMENT and LINE.

DOUBLINGS, in heraldry, the linings of robes and mantlings in atchievements.

DOUBLON, or DOUBLOON, a Spaniſh and Portugueſe coin, being the double of a piſtole. See PISTOLE.

DOUBTING, *Dubitatio*, the act of with-holding our aſſent from any propoſition, on ſuſpicion that we are not thoroughly appriſed of the merits thereof; or from not being able peremptorily to decide between the reaſons for and againſt it.

DOUBTING, in rhetoric, ſignifies the debate of the mind with itſelf, upon a preſſing difficulty. It is for the moſt part expreſſed by interrogation, though that is not neceſſary.

DOUCINE, in architecture, a moulding concave above and convex below, ſerving commonly as a cymatium to a delicate corniche. It is likewiſe called gula. See CYMATIUM and GULA.

DOVE, *Columba*, in ornithology. See PIGEON.

DOVE-TAILING, in carpentry, is the manner of faſtening boards together by letting one piece into another, in the form of the tail of a dove. The dove-tail is the ſtrongeſt of the aſſemblages or jointings, becauſe the tenon or piece of wood which is put into the other, goes widening to the extreme, ſo that it cannot be drawn out again, by reaſon the extreme of tip is bigger than the line.

DOWAGER, *Dotiſſa*, a widow endowed, is a title applied to the widows of princes, dukes, earls, and perſons of high rank only.

DOWER, that portion which the law allows a widow out of the lands of her huſband, after his deceaſe.

DOWLE-

DOWLE-STONES, in our old writers, the ſame with land-marks.

DOWRY, *Dos*, is properly the money or fortune which the wife brings her huſband in marriage: it is otherwiſe called *maritagium*, marriage-goods, and differs from dower. See DOWER.

DOWRY is alſo uſed, in a monaſtic ſenſe, for a ſum of money given along with a maid, upon entering her in ſome religious order.

DOXOLOGY, an hymn uſed in praiſe of the almighty, diſtinguiſhed by the title of greater and leſſer.

The leſſer doxology was anciently only a ſingle ſentence, without reſponſe, running in theſe words, "Glory be to the Father, and to the Son, and to the Holy Ghoſt, world without end, Amen." Part of the latter clauſe, "As it was in the beginning, is now, and ever ſhall be," was inſerted ſome time after the firſt compoſition. Some read this ancient hymn, "Glory be to the Father, and to the Son, with the Holy Ghoſt." Others, "Glory be to the Father, in or by the Son, and by the Holy Ghoſt." This difference of expreſſion occaſioned no diſputes in the church, till the riſe of the Arian hereſy; but when the followers of Arius began to make uſe of the latter, as a diſtinguiſhing character of their party, it was entirely laid aſide by the Catholics, and the uſe of it was enough to bring any one under ſuſpicion of heterodoxy. The doxology was uſed at the cloſe of every ſolemn office. The Weſtern church repeated it at the end of every pſalm, and the Eaſtern church at the end of the laſt pſalm. Many of their prayers were alſo concluded with it, particularly the ſolemn thankſgiving, or conſecration prayer at the euchariſt. It was alſo the ordinary concluſion of their ſermons.

The greater doxology, or angelical hymn, was likewiſe of great note in the ancient church. It began with theſe words, which the angels ſung at our Saviour's birth, "Glory be to God on high, &c." It was chiefly uſed in the communion ſervice, and in men's private devotions. In the Mozarabic liturgy, it is appointed to be ſung before the leſſons on Chriſtmas-day; and St. Chryſoſtom obſerves, that the Aſcetics met together daily to ſing this hymn. Both the doxologies have a place in the church of England, the former being repeated after every pſalm, and the latter uſed in the communion ſervice.

DRACHM, a Grecian coin, of the value of ſeven-pence three-farthings.

DRACO VOLANS, in meteorology, a fiery exhalation, frequent in marſhy and cold countries.

It is moſt common in ſummer, and though principally ſeen playing near the banks of rivers, or in boggy places, yet ſometimes mounts up to a conſiderable height in the air, to the no ſmall terror of the amazed beholders; its appearance being that of an oblong, ſometimes roundiſh, fiery body, with a long tail. It is entirely harmleſs, frequently ſticking to the hands and cloaths of people, without injuring them in the leaſt.

DRACO, in aſtronomy, a conſtellation of the northern hemiſphere, containing eighty ſtars, according to the following catalogue.

This was the dragon which Juno appointed to keep the golden apples in the orchard of the Heſperides, now thought to be the Cape de Verd iſlands; and, for his diligence and watchfulneſs, he was afterwards placed in heaven.

Order	Magn.	Name.	Bayer Let.	Right Aſcenſion.	Diſtance from Nor. Pole.	Var. in Right Aſcen.	Var. in Declination.
				° ′ ″	° ′ ″	″	″
1	3		λ	169.13.13	19.21.20	48.8	21. 9
2	6			170.25. 1	19.21. 4	48.7	21. 9
3	6			172.10.23	21.56.40	48.4	21. 0
4	6			184 51. 4	19.28.54	36.3	20. 6
5	3		κ	185.52.38	18.49.48	40.2	20. 6
6	6			186. 7.30	18.39.33	40.2	20. 2
7	6			189.22.41	21.54. 1	40.1	20. 6
8	6			181.23.34	23.15.49	36.5	20. 0
9	6			192.39.13	22. 7. 0	36.5	20. 0
10	5		*i*	206.10.14	24.5. 58	36.0	19. 0
11	2		α	209.26.33	24.31.17	24.5	17. 5
12	3		ι	229.52.18	30.13. 9	19.8	12. 9
13	3		θ	239.22. 5	30.48.56	17.2	10.22
14	3		η	245. 9.18	27.55.45	11.8	8. 4
15	4		A	247. 6.38	20.42.56	8.0	7. 9
16	5			247.43.27	36.36.35	8.0	7. 9
17	5			247.43.29	36.34.59	5 0	7. 8
18	5		*g*	249 47.13	24.57.20	4.0	6. 9
19	5			253.38.50	24.29.56	4.0	5. 9
20	6		*h*	253.40.31	24.35.15	13 0	5. 8
21	4		μ	255.52. 6	35.11.16	18.6	4.91
22	2		ζ	257. 9.30	23.59. 0	19.8	14. 9
23	3		*b*	261 19.34	37.30.52	20.2	3. 0
24	4	1ma ad	ν	261.55.44	34.38. 8	20.1	2. 8
25	4	2da ad	ν	261.57.14	34.38.58	20.4	2. 8
26	6			263. 7.31	28. 0.22	18.0	2. 4
27	5		*f*	263.12.26	21.43.15	12.0	2. 4
28	4		ω	264.35.11	21. 8.40	12.0	1. 9
29	6			265. 4.49	15.38.25	36.0	1. 8
30	6			265.52.47	39.9. 22	24.5	1. 4
31	7	1ma ad	Ψ	266.50. 8	17.43.44	24.6	1. 2
32	3		ξ	267.25.15	33. 4.51	24.1	0. 9
33	2		γ	267.47.13	38.28.20	20.6	0. 8
34	5	2da ad	Ψ	270. 7. 5	17.55.17	24.5	0. 0
35	6			270.16.10	12.56.32	48.8	0. 3
36	6			273.24.33	25.39.38	70.0	1. 0
37	6			274.16.48	21.19 48	12.4	1. 4
38	6			274.40.29	21.23.21	12.6	1. 4
39	5		*b*	274.45.56	31.20.12	24.3	1. 5
40	5			274.59.46	10. 3 35	70 2	1. 5
41	5			275. 7.14	9. 8.57	70.4	1. 5
42	6			276.13.58	24.35. 8	24.4	1. 7

Order.	Magn.	Name.	Bayer Let.	Right Aſcenſion.	Declination South.	Var. in Right Aſcen	Var. in Declination.
				° ′ ″	° ′ ″	″	″
43	5		φ	276.17. 7	18.48.18	24.5	2.1
44	4		χ	276.30.25	17.22.27	36.7	2.1
45	5		d	277.27.54	33. 7.54	24.4	2.6
46	5		c	279.33.16	34.41.59	24.5	3.2
47	4		o	281.56.59	30.54.37	13.4	4.2
48	6			283. 9.34	32.30. 4	13.6	4.5
49	6			283.58.43	34.41. 0	18.0	4.5
50	4			283.29.56	14.50.51	36.0	4.8
51	5			284.45. 9	36.58. 5	24.0	4.9
52	4		υ	284.25. 5	19. 2. 7	12.4	4.9
53	5			286.48.22	33.32.26	24.0	5.8
54	5			287.25.11	32.41.55	13.2	6.0
55	6			287.24.25	24.27.50	12.0	6.0
56	6		ε	287.33. 9	13.51.40	28.0	6.0
57	4		∂	288. 7. 5	22.45.47	4.0	6.2
58	4		π	289.54. 6	24.44.47	6.0	6.5
59	6			289.42. 5	13.50.55	24.9	6.7
60	4		τ	290. 6.18	17. 6.17	12.9	6.8
61	4		σ	293.13.44	20.42.47	11.4	7.8
62	6			296.40.47	17.31.23	5.0	8.9
63	5		ε	297.17.50	20.20.37	9.0	9.1
64	5		e	299.47.46	25.50.41	8.0	10.0
65	6			299.59.19	26. 2.40	14.3	10.0
66	6			300.25. 2	28.40.50	1.4	10.1
67	5		ρ	300 25.42	22.50. 0	5.0	10.2
68	6			301.52. 1	23.38.58	5.0	10.3
69	6			301.27.47	14.16.52	4.9	10.4
70	6			302.50.48	35.46.56	7.0	10.9
71	6			303.52.18	28.29.58	12.2	11.2
72	6			304.41.24	28.29.51	12.3	11.4
73	6			308.43.14	15.53. 3	3.1	12.5
74	6			310.59.31	9.46.49	40.0	12.8
75	6			311. 1.31	9.25.40	40.2	13.0
76	5			314.59.14	8.21.31	12.4	14.1
77	5			317.32.39	12.51.34	14.0	14.8
78	5			325. 2.21	18.47.17	14.0	16.4
79	7			327.31.15	17.25.50	15.0	16.9
80	6			331.22.59	19. 4.32	16.4	17.4

DRACOCEPHALUM, dragon's-head, in botany, a genus of plants, whoſe corolla conſiſts of a ſingle ringent petal. The tube is the length of the cup. The upper lip is obtuſe and arched; and the lower divided into three ſegments. The germen is quadripartite, which afterwards becomes four ovato-oblong ſeeds, included in the calyx.

This genus comprehends the moldivica of Tournefort, a ſpecies of which is known in the Engliſh gardens, by the name of balm of Gilead, or Turkey balm.

DRACONTIUM, dragon, in botany, a genus of plants, whoſe flower conſiſts of a cymbiform coriaceous ſpatha, which is large and univalvular, with a pentapetalous concave corolla, containing ſeven linear depreſſed ſtamina.

The fruit is a roundiſh berry, incloſing a number of ſeeds.

DRACUNCULI, in medicine, ſmall long worms, which breed in the muſcular parts of the arms and legs, called Guinea-worms.

This diſtemper is very common in Guinea, and principally among the natives; Kempfer found it ſo alſo at Ormuz, upon the Perſian gulph, and likewiſe in Tartary. Dr. Tawne, in his Treatiſe of the Diſeaſes of the Weſt-Indies, informs us, that this diſtemper is not ſo frequent any where as on the Gold Coaſt, at Anamboe, and Cormantyn.

The worm is white, round, and uniform, very much reſembling white round tape or bobbing. It is lodged between the interſtices and membranes of the muſcles, where it inſinuates itſelf, ſometimes exceeding five ells in length. It occaſions no great pain at the beginning; but at ſuch times as it is ready to make its exit, the parts adjoining to the extremity of the worm, where it attempts its excluſion, begin to ſwell, throb, and be inflamed: this generally happens about the ancle, leg, or thigh, and rarely higher.

The countries where this diſtemper is obſerved, are very hot and ſultry, liable to great droughts, and the inhabitants make uſe of ſtagnating and corrupted water, in which it is very probable that the ova of theſe animalcula may be contained; for the white people who drink this water, are obnoxious to the diſeaſe as well as the negroes.

The ſurgeons ſeldom attempt to extract this worm by making an inciſion; but as ſoon as they perceive the tumour riſe to a competent bulk, they endeavour to bring it to a ſuppuration, with all convenient expedition; and then the head of the worm diſcovers itſelf, which they ſecure, by tying it to a bit of ſtick or cotton, that it may not draw itſelf up again: thus they continue to roll it round the ſtick, ſometimes one inch, ſometimes two or more, each day, taking great care not to break the worm, elſe it will be very difficult to recover the end of it again; and an abſceſs will be formed, not only at the ſuppurated part, but likewiſe through the whole winding of the muſcles, where the dead putrifying worm remains, which generally occaſions very obſtinate ulcers. During the extraction of the worm, the patient ſhould be plied with bitter aloetic and other anthelmintic medicines, in order to diſlodge the worm the ſooner from his tenement. When the worm is totally extracted, the remaining ulcer may be treated in the ſame manner as other common ulcers; nor does any farther inconvenience remain in the parts of which it had poſſeſſion. This diſeaſe, ſimply conſidered, very rarely, if ever, proves mortal.

DRACUNCULI is alſo uſed for a diſeaſe in children, ariſing from little worms called by that name. See the article WORM.

DRAGONS, dracunculus, in botany, formerly a diſtinct genus of plants; but now comprehended

by Linnæus among the arums; for its generical characters and medicinal virtues, see the article ARUM.

DRAGANT, the same with tragacanth. See the article TRAGACANTH.

DRAGOMAN, DROGMAN, or DRUGGERMAN, a name given in the Levant to the interpreters kept by the ambassadors of Christian nations residing at the Porte, to assist them in treating of their masters affairs.

DRAGON, *Draco*, in zoology, an animal called also the flying lizard, being furnished with two lateral, membranaceous, and radiated wings: it is a true lizard, with a naked and four-legged body, and a long tail: though there are not wanting some who deny the existence of any such animal.

DRAGON'S BELLY, in astronomy. See the article VENTER DRAGONIS.

DRAGON'S BLOOD, *Sanguis Draconis*, in natural history, a moderately heavy resin, of a red colour, brought from the East-Indies. There are two sorts of it; one in small oval drops or tears, of a fine deep red, which is heightened into a crimson on grinding them into powder; the other is in larger masses, apparently composed of tears: of these, some are of a pale dull red, others of a deep one, not at all inferior to the drop sort.

The drops and the lumps are supposed to be the produce of two different trees. The lump sort is said to exude from the trunks of certain palms growing in the Madeira and Canary islands; the drops to be artificially extracted from the fruit of a tree. According to Kempfer, the fruit is laid upon a kind of hurdle, over a large vessel half full of water. The whole being lightly covered, the water is made to boil, when the fruit being softened by the steam, a red juice, which was not discoverable in it before, appears upon the surface: this is scraped off upon flag leaves, and exposed to the air to dry. The same author informs us, that some of the preparers of this commodity boil the fruit in water till all the colouring particles are extracted or melted out; after which, the aqueous fluid is evaporated, till the remainder begins to thicken, when it is further exsiccated upon flag leaves, as before.

This drug has been sometimes counterfeited with artificial compositions, coloured with the true dragon's blood, or Brazil wood: these are distinguished by their either dissolving in water like gums, or crackling, and not burning in the fire.

The genuine dragon's blood is not acted upon by water, or at most communicates to it only a slight yellowish tinge: laid on a red-hot iron, it readily melts, catches flame, and emits an acid fume approaching to that of benzoine. It dissolves, but not perfectly, in rectified spirit of wine, and tinges a large quantity of the menstruum of an elegant blood-red colour: it dissolves readily in oils, and tinges them of a pretty deep red, but somewhat less beautiful than the colour of the spirituous tincture, and considerably less so than that which anchusa imparts to oil.

The spirituous tincture stains cold marble of a bright flesh colour; to warm marble it gives a deeper red, in proportion to the degree of heat. Mr. du Fay observes, that by this one ingredient, with the addition of a little pitch for the darker colours, all the various shades of red may be obtained, from the lightest to the deepest; that it does not sink near so far into cold as into hot marble; and that the not sinking is rather an advantage than an imperfection, as the colours which sink must also spread, so as to render the drawing of fine designs impracticable; that the best way of obtaining beautiful reds from dragon's blood is, to put the powdered resin into spirit of wine over the fire, and apply on the marble with a pencil the finer part of the solution which rises up about the sides of the vessel, adding fresh spirit in proportion to the evaporation, till the dragon's blood yields no more tincture.

This resin, in substance, has no smell or taste: when dissolved, it discovers a slight degree of pungency. It is usually looked upon as a gentle incrassant, deficcative, and restringent; and sometimes prescribed in these intentions against alvine and uterine fluxes, and ulcerations both internal and external.

DRAGON-FLY, the English name of the libella. See the article LIBELLA.

DRAGONS'-HEAD and TAIL, the two nodes of the moon. See the article NODE.

DRAGON-SHELL, the English name of a species of concamerated patella, with its rostrum very much bent. See the article PATELLA.

DRAGONNE, in heraldry, a lion dragonnée is where the upper half resembles a lion, the other half going off like the hinder part of a dragon. The same may be said of any other beast as well as a lion.

DRAGOON, in war, a kind of soldier, who acts on horseback, but without boots, and fights on foot generally; they are posted in the front of the camp, and march first to the charge. As infantry, they have serjeants, and as cavalry, cornets; their arms are a sword, firelock, and bayonet; and when they march on foot, their officers bear the pike and the serjeant the halbert. Menage derives the word from the Latin *draconarius*, used by Vegetius to signify soldiers; but it is more probably derived from the German *tragon* or *dragben*, signifying to carry, as being infantry carried on horseback.

DRAGOON, in ornithology, the name of a small kind of carrier-pigeon, called *columba tabellaria minima*, by Moore. It is a bastard-breed between the two species of pigeons called the horseman and the tumbler. They are very good breeders; and as they are lighter than the horseman, they are supposed to be more expeditious in flight for a few miles;

miles; but the horſeman excels them in greater lengths.

DRAINING *of lands*. See the article FEN.

DRAINS, a name given, in the fen-countries, to certain large cuts or ditches, of twenty, thirty, nay ſometimes forty feet wide, carried through the marſhy ground, to ſome river, or other place, capable of diſcharging the water they carry out of the fen-lands. See the article FEN.

DRAKE, in ornithology, the male of the duck-kind. See DUCK.

DRAM, or DRACHM, in commerce, a ſmall weight. See WEIGHT.

DRAMA, a poem containing ſome certain action, and repreſenting a true picture of human life, for the delight and improvement of mankind.

The principal ſpecies of the drama are two, comedy and tragedy. Some others there are of leſs note, as paſtoral, ſatire, tragi-comedy, opera, &c. See the articles TRAGEDY, COMEDY, &c.

The primary parts of the drama as divided by the ancients, are the protaſis, epitaſis, cataſtaſis, and cataſtrophe. The ſecondary parts are the acts and ſcenes. The acceſſary parts are the prologue, chorus, mimus, and epilogue, which pointed out the uſe of the piece, or conveyed ſome other notice to the audience in the poet's name. See PROTASIS, PROLOGUE, CHORUS, &c.

The drama, ſays Voſſius, owes its riſe to the days of feſtivity; for in ancient times, it was uſual for men, when they gathered in the fruits of the earth, to meet together, that they might ſacrifice to the Deity, and unbend their minds from the fatigues of the harveſt. Hence aroſe two ſorts of poetry, the one grave, in praiſe of the gods; the other jocoſe and full of lampoon, againſt one another. Thus, from the former aroſe tragedy, and from the latter, ſatire, comedy, and mimickry.

The drama, in ſome circumſtances, is ſuperior to epic poetry, particularly in action; for in the drama, the perſons themſelves are introduced, every thing is tranſacted in our ſight, and our eyes and ears at once are gratified. Beſides, the action in the drama is much more compendious than in the epic: it takes up leſs time, and therefore requires more art to conduct it. It excites in the mind more rapid commotions, and conſequently makes the pleaſure and admiration more intenſe. For which reaſons Ariſtotle gives the preference to the drama; not that he reckons it more noble in general than the epic, for that would be contrary to truth and reaſon, but only as far as its ſphere extends.

According to the Abbé du Bos, tragic poets ought to place their ſcenes in times remote from that in which they live; but that comedy, on the contrary, ought to be fixed in the very places and times in which it is repreſented; its deſign being to make us laugh at the expence of ridiculous perſons, in order to purge us of thoſe faults it expoſes. Now we cannot diſtinguiſh nature ſo eaſily, when ſhe appears in ſtrange cuſtoms, manners, and apparel, as when ſhe is clad, as it were, after our own faſhion; whereas we always diſtinguiſh human nature in the heroes of tragedies, whether their ſcenes be at Rome or Sparta, by reaſon only great virtues or great vices are there repreſented.

The dramatic poetry of the Romans was at firſt divided into three ſorts, tragedy, ſatire, and comedy; which were afterwards ſubdivided into ſeveral ſpecies. They had two ſpecies of tragedies, viz. the tragœdiæ palliatæ, in which the perſonages, manners, and dreſs, were entirely Greek; and the tragœdiæ prætextatæ, or pretextæ, wherein the perſonages and manners were Roman. The ſatire was a kind of paſtoral poetry, which ſome authors aſſert to have held a kind of middle rank between tragedy and comedy; which is almoſt all we know of it. Comedy, in like manner as tragedy, was divided firſt into two ſpecies, viz. the Greek, or palliata, and the Roman, or togata, by reaſon of the introducing plain citizens into the latter, whoſe dreſs was called toga. The Roman comedy was again ſubdivided into four ſpecies; the togata, properly ſo called, the tabernaria, the atellana, and the mimus. Pieces of the firſt ſort were very ſerious, and admitted even of perſons of diſtinction, for which reaſon they were ſometimes called prætextatæ. The ſecond were comedies of a leſs ſerious nature, and took their name from taberna; which ſtrictly ſignified a place of rendezvous, proper for aſſembling perſons of different conditions, whoſe characters were played off in thoſe pieces. The atellana was a kind of piece very like the Italian comedies; that is, thoſe whoſe dialogues are not written. The actor, therefore, of the atellanæ performed his part juſt as he pleaſed. The mimus reſembled our farces, and the actors thereof performed always bare-foot: whereas, in tragedy, they wore a ſort of ſhoe, or boot, called cothurnus; and, in other ſpecies of comedy, another kind called ſoccus.

For the laws of the drama, ſee the articles UNITY, ACTION, CHARACTER, FABLE, &c.

DRAMATIC, in poetry, an epithet given to pieces written for the ſtage.

DRANK, in huſbandry, a term uſed to denote wild oats, which never fail to infeſt worn-out lands; ſo that when ploughed lands run to theſe weeds and thiſtles, the farmer knows it is high time to fallow them, or elſe to ſow them with hay-ſeed, and make paſture of them.

Some, indeed, deſtroy the drank, by ſowing the lands with beans, and letting looſe ſheep upon them when young. This muſt be done in dry weather, and the ſheep eat up the drank and other weeds, without touching the beans.

DRAPERY, in ſculpture and painting, implies the repreſentation of the cloathing of human figures, and

and alſo hangings, tapeſtry, curtains, and moſt other things that are not carnations or landſkapes.

The art of drapery conſiſts, 1. In the order of the folds or plaits, which ought to be ſo managed, that you may eaſily perceive what it is they cover, and diſtinguiſh it from any thing elſe. Again, the folds ought to be large, as breaking and dividing the ſight the leſs; and there ſhould be a contraſt between them, otherwiſe the drapery will be ſtiff. 2. In the quality of the ſtuffs; for ſome make their folds abrupt and harſh; others more ſoft and eaſy: the ſurface of ſome have a luſtre, others are flat and dead; ſome are fine and tranſparent, others firm and ſolid. 3. In the variety of colours, which, when well managed, makes the greateſt beauty of painting; all not being equally amicable and friendly with reſpect to each other, and ſome never to be placed near certain others.

M. De Piles obſerves, that drapery muſt never be made to adhere to the parts of the body; that a great motion and lightneſs of the drapery are only proper in figures in great agitation, or expoſed to the wind; and that the nudities of the figures ſhould always be deſigned, before the painter proceeds to the draperies.

DRASTIC, in phyſic, an epithet beſtowed on ſuch medicines as are of preſent efficacy, and potent in operations; and is commonly applied to emetics and cathartics.

DRAUGHT, or DRAFT, in architecture, the figure of an intended building, deſcribed on paper, in which is laid down, by ſcale and compaſſes, the ſeveral diviſions and partitions of the apartments, rooms, doors, paſſages, &c. in their due proportion to the whole building.

It is cuſtomary, and alſo exceedingly convenient, for any perſon, before he begins to erect a building, to have deſigns or draughts drawn upon paper or vellum, wherein the ichnography or ground-plot of every floor or ſtory is delineated; as alſo the form or faſhion of each front, with the windows, doors, ornaments, in an orthography, or upright. Sometimes the ſeveral fronts, &c. are taken and repreſented in the ſame draught, to ſhew the effect of the whole building, which is called ſcenography, or perſpective. See the article SCENOGRAPHY.

DRAUGHT-COMPASSES, are ſuch as have moveable points to draw fine draughts in architecture.

DRAUGHT, in trade, called alſo CLOFF or CLOUGH, is a ſmall allowance on weighable goods, made by the king to the importer, or by the ſeller to the buyer, that the weight may hold out when the goods are weighed again.

The king allows 1 ℔ draught for goods weighing no leſs than 1 C wt. 2 ℔ for goods weighing between 1 and 2 C wt. 3 ℔ for goods weighing between 2 and 3 C wt. 4 ℔ from 3 to 10 C wt. 7 ℔ from 10 to 18 C wt. 9 ℔ from 18 to 30, or upwards.

DRAUGHT-HOOKS, are large hooks of iron, fixed on the cheeks of a cannon-carriage, two on each ſide, one near the trunnion-hole, and the other at the train, diſtinguiſhed by the name of fore and hind draught-hooks. Large guns have draught-hooks near the middle tranſum, to which are fixed the chains that ſerve to keep the ſhafts of the limbers on a march. The fore and hind hooks are uſed for drawing a gun backwards or forwards by men with ſtrong ropes, called draught-ropes, fixed to theſe hooks.

DRAUGHT-HORSE, in farming, a ſort of coarſe made horſe, deſtined for the ſervice of the cart or plough. In the choice of theſe horſes, for what is called the ſlow draught, they are to be choſen of an ordinary height; for otherwiſe, when put into the cart, one draws unequally with the other, and the tall ones hang upon the low ones. The draught-horſe ſhould be large bodied, and ſtrong loined, and of ſuch a diſpoſition as rather to be too dull than too briſk; and rather to crave the whip than to draw more than is needful. Mares are the fitteſt for this uſe for the farmer, as they will be kept cheap, and not only do the work, but be kept breeding, and give yearly encreaſe of a foal of the ſame kind, and fit to be bred to the ſame purpoſes. They ſhould have a good head, neck, breaſt, and ſhoulders: for the reſt of the ſhape, it is not of much conſequence, only for breeding; the mare ſhould have a large belly; for the more room the foal has in the dam, the more fit he will be for that employ. See the article FOAL.

DRAW-BACK, in commerce, certain duties, either of the cuſtoms or of the exciſe, allowed upon the exportation of ſome of our own manufactures; or upon certain foreign merchandiſe, that have paid duty on importation.

DRAW-BRIDGE, a bridge made after the manner of a floor, to draw up, or let down, as occaſion ſerves, before the gate of a town or caſtle.

A draw-bridge may be made after ſeveral different ways, but the moſt common are made with plyers, twice the length of the gate, and a foot in diameter. The inner ſquare is traverſed with a croſs, which ſerves for a counterpoiſe; and the chains which hang from the extremities of the plyers to lift up or let down the bridge, are of iron or braſs.

In navigable rivers it is ſometimes neceſſary to make the middle arch of bridges with two moveable platforms, to be raiſed occaſionally, in order to let the maſts and rigging of veſſels paſs through. This kind of draw-bridge is repreſented in the plate; where A B is the width of the middle arch; A L and B L, the two piers that ſupport the draw-bridge N O, one of the platforms of which is raiſed, and the other let down, having the beam P Q for its plyer. To N O are ſuſpended two moveable braces E H, E H, which, reſting on the ſupport E, preſs againſt

againſt the bracket M, and thereby ſtrengthen the draw-bridge. Theſe braces are conducted to the reſt by means of the weight S, pulling the chain SLE.

DRAW-GEAR, denotes any kind of harneſs for draught horſes.

DRAWER *of a Bill of Exchange*, the perſon who draws the bill upon his correſpondent.

DRAWING, in general, denotes the action of pulling out, or haling along: thus we read of tooth-drawing, wire-drawing, &c. See TOOTH and WIRE.

DRAWING, the art of repreſenting the appearances of objects by imitation, or copying without the aſſiſtance of mathematical rules.

The general precepts for drawing, are as follow:

1. Begin with plain, geometrical figures, as lines, angles, triangles, polygons, arches, circles, ovals, cones, cylinders, and the like, being the foundation of all other proportions. The circle is of uſe in the ſeveral orbicular forms, as the ſun, moon, globes, &c. the oval in giving a juſt proportion to the face and mouth; and the ſquare confines a picture you are to copy, &c. the triangle is of uſe in drawing a ſide or half face; angles and arches in perſpective, and the polygon in ground-plots, fortifications, &c. the cone, in ſpires, ſteeples, tops of towers, &c. the cylinder, in columns, pillars, pilaſters, &c. See the article PERSPECTIVE.

2. Having brought your hand to be fit and ready in general proportions, accuſtom yourſelf to give every object its due ſhade, according to its concavity or convexity, and to elevate or depreſs the ſame, as the object appears either nearer or farther off the light. See the articles PROPORTION, DESIGN, and SHADE.

3. The ſecond practice of drawing conſiſts in forming fruits, as apples, pears, cherries, &c. with their leaves; the imitation of flowers, as roſes, tulips, carnations, &c. herbs, trees, &c. of different kinds.

4. The third, in the imitation of beaſts, fowls, fiſhes, &c.

5. The fourth practice of drawing conſiſts in the imitation of the body of men, with all its lineaments, as head, noſe, eyes, ears, cheeks, arms, and ſhadows, all exactly proportioned, both to the whole, and to one another.

6. The fifth is in the drapery, in the imitation of cloathing, and artificially ſetting off the outward coverings, habit, and ornaments of the body, either of cloth, ſtuff, ſilk, or linen, in their natural and proper folds. See DRAPERY.

7. In drawing of all the forms before-mentioned, it is requiſite to be firſt perfect in the laying down the exact proportion; ſecondly, in the general or outward lines, before you proceed to ſhadowing, or trimming the work within.

8. In mixed and uncertain forms, where the circle, ſquare, &c. will be of no uſe, but only in the idea thereof in your own fancy, as horſes, oxen, and the like, you muſt do it by judgment, and ſo gain the true proportions by aſſiduous practice: thus, having the ſhape of the thing in your mind, firſt draw it rudely with a coal; then, with more exactneſs, with a lead or pencil; then peruſe it well, and mend it in thoſe parts you have erred in, according to the idea you carry in your mind. When it is mended by your own judgment, compare it with ſome good pattern of the ſame kind, and amend it by that.

9. Having good copies to draw after, learn to reduce them to other proportions, either larger or ſmaller, and this by frequent practice.

10. Let a perfection in drawing be attained by diligent exerciſe, and the inſtruction of a good maſter, before there be any attempts as to colouring and painting; for the former being attained, the reſt will be eaſily underſtood, and gained by frequent practice.

DRAWING-MEDICINES, thoſe more uſually called epiſpaſtics and ripeners.

DRAWING, among ſportſmen, the beating the buſhes after a fox.

Fine DRAWING, among taylors, the art of ſewing up button-holes, or any rents in cloth, in ſo nice a manner, as that they cannot be diſcovered from the entire part of the cloth.

DRAY, a kind of cart uſed by brewers for carrying barrels of beer or ale; alſo a ſledge drawn without wheels.

DRAY, among ſportſmen, denotes ſquirrel-neſts built in the tops of trees.

DREIN, or DRAIN, in military affairs, a ſmall foſſe or trench, formed to draw the water from the ditch which ſurrounds the place beſieged: the ditch is afterwards filled with faſcines, gabions, hurdles, &c. to facilitate the paſſage of the troops acroſs it. See DITCH.

DRENCH, among farriers, a phyſical potion for horſes. The ingredients for this purpoſe are to be beat coarſely, and either mingled with a decoction, or with wine. Then infuſe it all about a quarter of an hour, and give it to the horſe with a horn, after he has been tied up two hours to the rack.

DRESSING *of Hemp or Flax*. See HEMP and FLAX.

DRESSING *of Ores*, the preparing them, as they come rough from the mine, for the working by fire. This is done ſeveral ways in different countries, and in reſpect to the different ores of different metals. In Devonſhire they have a very eaſy method, which is ſo expeditious, and ſo good for all the purpoſes, that it is worthy copying in other places. After the ore is dug, it is toſſed up by hand from ſhamble to ſhamble by the ſhovel men in the mine, and drawn up in buckets by a winch at the top of a ſhaft. As ſoon as the whole quantity for one dreſſing is brought up,

the large ſtones are broken, and the whole is then carried to the mills, where one horſe turns a wheel that moves the machines for powdering a great quantity of it; theſe are called the ſtamping or knocking mills. The ore is unloaded at the head of the paſs or entrance into theſe mills; this paſs is made of two or three bottom boards, and two ſide boards, in form of a hollow trough, and ſtands in a ſlanting direction. The ore by its own weight is carried down this trough, and lodges itſelf in the coffer. The coffer is a long ſquare box made of the firmeſt timber, and of three feet long, and a foot and a half broad: the ore is not ſuffered to fall into this all at once, but is ſtopped over the mouth of the trough by a croſs board, where a cock turns into it a quantity of water at the ſame time, which waſhes down juſt as much of the ore with it into the trough as there ought to be. In this coffer there are three lifters placed between two ſtrong board leaves, having two braces or thwart pieces on each ſide to keep them ſteady, and a frame with ſtamp heads. Theſe heads are of iron, and weigh about thirty or forty pounds a-piece, and ſerve to break the lumps of ore in the coffer.

The lifters are about eight feet long, and half a foot ſquare. They are always made of heart of oak, and have as many timbers or guiders between them; they are lifted up in order, by a double number of toppits, which are faſtened to as many arms paſſing diametrically through the greateſt beam, which is either turned by the wheel and horſe, or where there is conveniency of water, by an over-ſhot water-wheel on two boulters. The toppits exactly, but eaſily, meet with the tongues, which are ſo placed in the lifters, as that they eaſily ſlide from each other, and ſuffer the lifters to fall with great force on the ore in the trough. The frequent pounding of theſe ſoon reduces the large maſſes into a ſort of ſand, which is waſhed out of the trough by the continual current of the water from the cock through a braſs grate, placed at one end of the coffer between two iron bars.

The powdered ore is conveyed out of the trough into the launder, which is a trench cut in the floor of eight feet long, and ten feet over; this is ſtopped at the lower end with turf, ſo that the water is all ſuffered to paſs away, and the powder of the ore is ſtopped. Thus the launder by degrees fills up with the dreſſed ore; and this is removed out with ſhovels, as occaſion requires. The launder is divided into three parts, the forehead, the middle, and the tail; that ore which lies in the forehead, that is, within a foot and a half of the grate, is always the richeſt and beſt, and is laid up in a heap by itſelf; the middle and tail afford a poorer ore; and theſe are ſometimes laid up in ſeparate heaps; ſometimes thrown into one heap together.

DRESSING, in ſurgery, the treatment of a wound or any diſordered part. The apparatus of dreſſing conſiſts of doſſils, tents, plaſters, compreſſes, bandages, bands, ligatures, and ſtrings.

DRIFT *of the Foreſt* is an exact view and examination taken at certain times to know what beaſts are there, in order that none may come on the foreſt but ſuch as have right; and that the foreſt be not overcharged with beaſts.

DRIFT, in mining, a paſſage cut out under the earth, betwixt ſhaft and ſhaft, or turn and turn; or a paſſage or way, wrought under the earth, to the end of a meer of ground, or part of a meer.

DRIFT, in navigation, the line upon which a ſhip drives in a ſtorm with her ſide to the wind, when it blows ſo violent as to prevent her from being able to carry any ſail, or only enough to keep her ſufficiently inclined to one ſide, that ſhe may not carry away her maſts by violent rocking: or, drift is the angle which the line of her motion makes with the keel in ſuch a ſituation when her prow is in the middle between the points of the compaſs, to which ſhe comes up and falls. See the article TRYING.

DRILL, in mechanics, a ſmall inſtrument for making ſuch holes as punches will not conveniently ſerve for.

Drills are of various ſizes, and are chiefly uſed by ſmiths and turners.

DRILL, or DRILL-BOX, a name given to an inſtrument for ſowing land in the new method of horſe-hoeing huſbandry. It plants the corn in rows, makes the channels, ſows the ſeeds in them, and covers them with earth when ſown; and all this at the ſame time, and with great expedition. The principal parts are the ſeed-box, the hopper, the plough and its harrow, of all which the ſeed-box is the chief. It meaſures, or rather numbers, out the ſeed, which it receives from the hopper, and is for this purpoſe an artificial hand; but it delivers out the ſeed much more equally than can be done by a natural hand. See the article PLOUGH.

DRINK, a part of our ordinary food in a liquid form, ſerving to dilute and moiſten the dry meat.

DRIPS, in architecture. See the article LARMIER.

DRIVER, in naval affairs, an oblong ſail hoiſted occaſionally to the mizen-peek when the wind is very fair; the lower corners of it are extended by a boom or pole, which is thruſt out a-croſs the ſhip over the quarter. See MIZEN and QUARTER.

DRIVERS, among ſportſmen, a machine for driving pheaſant-powts, conſiſting of good ſtrong ozier-wands, ſuch as the baſket-makers uſe; theſe are to be ſet in an handle, and twiſted or bound with ſmall oziers in two or three places.

With this inſtrument the ſportſman drives whole eyes of young powts into his nets.

DRIVING, among ſportſmen, a method of taking pheaſant-powts. It is thus performed: the ſportſman finds out the haunts of theſe birds; and having fixed his nets there, he calls them together by a pheaſant-call,

call, imitating the voice of the dam: after this he makes a noiſe with his driver, which will make them run a little way forward in a cluſter; and this he is to repeat till he has made ſure of them, which an expert ſporſman never fails to do, by driving them into his nets.

DRIVING, in metallurgy, is ſaid of ſilver, when in the operation of refining, the lead being burnt away, the remaining copper riſes upon its ſurface in red fiery bubbles. See the article SILVER.

DROCK, in huſbandry, the upright piece of timber on the right ſide of a plough's tail, to which is fixed the earth-board. See PLOUGH.

DROMEDARY, *Dromedarius*, a large animal of the camel-kind, with only one bunch on its back: it is taller than the horſe, and has a much longer and ſlender neck: its ears are ſhort, and the upper lip is divided in the manner of that of the hare. It is a native of Aſia, and more uſed for riding on, than for carrying heavy loads.

DROMEUS, a name given by the ancients to two very diſtinct animals, the ſtag and dromedary.

DRONE, in the hiſtory of inſects, a kind of male bee, larger than the common working or honey-bees: it is ſo called from its idleneſs, as never going abroad to collect either honey or wax. See BEE.

DRONE-FLY, a two winged inſect, extremely like the common drone-bee, whence alſo the name.

DROPS, in architecture, an ornament in the Doric entablature, repreſenting drops, or little bells, immediately under the triglyphs.

DROPSY, in medicine, a preternatural collection of extravaſated aqueous ſerum, which greatly diſtends the veſſels in any part of the body.

This diſeaſe may therefore happen in whatever part the veſſels deſtined for the conveyance of the ſerum are found; that is, either in the whole habit of the body, or in any particular part thereof.

Thus a dropſy may ariſe from a ſordid collection of water, either between the external integuments of the head; between theſe and the cranium; between the cranium and the membranes of the brain; between theſe membranes and the duplicatures; between theſe duplicatures and the brain; between the foldings of the brain; and, laſtly, in its cavities, but yet without producing immediate death.

In the cure of a dropſy the following intentions are to be purſued.

Firſt, to produce a due fluidity and motion to the lymph, whether it is water or ſerum, of the bilious, ichorous, or bloody kind.

Secondly, to evacuate the waters already diſcharged into the cavities of the body.

Thirdly, to remove the weakneſs of the viſcera, whether this weakneſs is the cauſe or the effect of the dropſy.

The fluidity of the lymph is procured, by removing thoſe cauſes which prevent ſuch a fluidity; which are, firſt, the too languid force of the vital powers ſubſervient to circulation; ſecondly, the compreſſion, rupture, or obſtruction of the veſſels; and, thirdly, the exceſſive or preternatural viſcidity of the fluids.

With reſpect to the too languid force of the vital powers ſubſervient to circulation, this is moſt commodiouſly removed by cardiacs, corroboratives, and medicines of a ſtimulating quality, which, if the patient is not afflicted with a violent thirſt, are to conſiſt of aromatic, ſaline, oleous, and hot ſubſtances; which may be eaſily prepared in the various forms of electuaries, mixtures, medicated wines, medicated ales, pills, decoctions, ſyrups, &c.

DROP-WORT. See FILIPENDULA.

Water DROP-WORT, in botany. See the article OENANTHE.

DROSERA, ſun-dew, in botany, a genus of plants, whoſe flower conſiſts of a monophyllous perſiſtent calyx, cut in five ſharp-points. The corolla is funnel-ſhaped, and compoſed of five obtuſe ſubovate petals, with the ſame number of ſtamina.

The fruit is an oval unilocular capſule, containing a great number of very ſmall ſeeds.

DROWNING, the act of ſuffocating, or being ſuffocated, by water.

Naturaliſts and phyſicians furniſh us with divers well atteſted inſtances of ſurpriſing recoveries of perſons drowned. It is certain from repeated diſſections made on perſons drowned, that they generally have leſs water in their ſtomachs than if they had voluntarily drank a conſiderable quantity: whence it does not ſeem expedient to hang the drowned perſon by the heels, a poſition that muſt prove uneaſy as ſoon as the humours of the body ſhould reſume their ordinary motion. In order to know whether the perſon has ſwallowed too much water, or not, and to make him vomit it up if he has, it is proper to put him in a tun open at both ends, which is to be rolled in different directions; or the bearded end of a feather ſhould be introduced into the œſophagus. After taking off the cloaths of the drowned perſon, we ought, with the utmoſt expedition, to ſhelter him from the impreſſions of the cold air, and begin to warm him by wrapping him up with cloaths and coverings: to do this more effectually, he is afterwards to be put into a pretty warm bed, applying alſo to his body hot napkins and cloths. A hot ſcorching ſun, to which drowned perſons have been expoſed, and hot baths, have produced the ſame happy effects.

The great intention to be purſued is to put the ſolid parts of the machine in action, that thus they may reſtore the motion of the fluids: in order to this, the drowned perſon ſhould be agitated in various directions, in a bed, in the arms of perſons of ſufficient ſtrength.

Spirituous liquors or warm urine ſhould be poured into his mouth, and ſome perſons preſcribe a decoc-

tion

tion of pepper and vinegar, as a gargariſm; we muſt alſo attempt to irritate the internal fibres of the noſe, either by volatile ſpirits, and by the liquors uſed in apoplectic caſes; or by tickling the nerves of the noſtrils with a bearded feather, or by blowing through a quill, ſnuff, or ſome other more powerful ſternutatory. One of the means frequently uſed with ſucceſs, is to blow warm air, by means of a pipe, into their mouths; or to introduce it by a pair of bellows; or, by injecting warm clyſters, to irritate the inteſtines: the ſmoke of tobacco conveyed into the inteſtines, by means of a tobacco-pipe, is much recommended. Venæſection is by no means to be neglected; and perhaps moſt ſucceſsfully in the jugular vein; and when all theſe meaſures prove unſucceſsful, the laſt recourſe is bronchotomy. See the article BRONCHOTOMY.

DRUG, a general term for goods of the druggiſt and grocery kinds, eſpecially for thoſe uſed in medicine and dying.

DRUGGET, in commerce, a ſtuff ſometimes all wool, and ſometimes half wool and half thread, ſometimes corded, but uſually plain.

DRUIDS, the prieſts among the ancient Britons and Gauls.

The word is formed from the Celtic, *deru*, an oak; becauſe they held that tree in the higheſt veneration.

Their antiquity is eſteemed equal to that of the Brachmans of India, the Magi of Perſia, and the Chaldees of Babylon. And whoever conſiders the ſurpriſing conformity of their doctrine, will find ſufficient reaſon to think that they all derived it from the ſame hand, we mean from Noah and his immediate deſcendants, who carried it with them at their diſperſion; for it cannot be ſuppoſed that the Britiſh druids derived their doctrine from any foreign ſect, to whom they were abſolutely unknown.

But the druids were not contented with the power annexed to the prieſthood; they introduced religion into every tranſaction both public and private, ſo that nothing could be done without their approbation; and by this means their authority was rendered almoſt abſolute. They elected the annual magiſtrates of every diſtrict, who ſhould have enjoyed, during that term, the ſupreme authority, and ſometimes the title of kings; but they could not even call a council without their approbation and advice: ſo that, notwithſtanding their pretended authority, they were in reality the creatures and ſlaves of the druids.

They exerciſed the ſame arbitrary power in their courts of juſtice; and whoever refuſed to ſubmit to their deciſions, were excluded from the public ſacrifices, which was conſidered as the greateſt puniſhment that could be inflicted. It muſt however be acknowledged, that their adminiſtration of juſtice has always been celebrated for its impartiality. The ſole management and inſtruction of youth was alſo committed to them, except the training them up in the art of war; for both they and their diſciples were not only exempted from going to war, but likewiſe from all kind of tribute.

Their garments were remarkably long; and, when employed in religious ceremonies, they always wore a white ſurplice. They generally carried a wand in their hands, and wore a kind of ornament enchaſed in gold about their necks, called the druid's egg. Their necks were likewiſe decorated with gold chains, and their hands and arms with bracelets: they wore their hair very ſhort, and their beards remarkably long.

They were all ſubordinate to a chief or ſovereign pontiff, ſtiled the arch-druid, choſen from among their fraternity by a plurality of voices; but, in caſe of a competition too powerful to be decided by a majority, the conteſt was determined by the ſword. He enjoyed his ſupremacy for life, had power to inſpect the conduct of kings, and either to elect or depoſe whenever he pleaſed.

It was one of the maxims of their religion, not to commit any thing to writing; but deliver all their myſteries and learning in verſes compoſed for that purpoſe; and theſe were in time multiplied to ſuch a number, that it generally took up twenty years to learn them all by heart. By this means their doctrines appeared more myſterious by being unknown to all but themſelves; and having no books to recur to, they were the more careful to fix them in their memory.

But what had ſtill a more direct tendency to impoſe on the public, was their pretended familiar intercourſe with the gods. And, in order to conceal at once their own ignorance, and render the impoſition leſs ſuſceptible of detection, they boaſted of their great ſkill in magic, and cultivated ſeveral branches of the mathematics, particularly aſtronomy. The latter they carried to ſome degree of perfection; for they were able to foretel the times, quantities, and durations of eclipſes; a circumſtance which could not fail of attracting reverence from an ignorant multitude, who were perſuaded that nothing leſs than a ſupernatural power was ſufficient to make ſuch aſtoniſhing predictions: they alſo ſtudied natural philoſophy, and practiſed phyſic.

DRUM, a military muſical inſtrument, uſed principally amongſt the foot, to call the ſoldiers together, direct their marches, attacks, and retreats. The body of the drum is of a very thin oak, bent into a cylinder, and covered with parchment, which is ſtrained or braced, more or leſs, according to the height or depth of the tone required, by ſtrings, and ſtruck with ſticks. The height of the drum is equal to its breadth, which does not exceed two feet and an half, becauſe no ſkins can be procured to cover bigger.

There are alſo drums whoſe bodies are braſs, called kettle-drums, which are rounded in the bottom like a baſon; they are uſed among the horſe:

to be played on; they are laid acroſs the ſhoulders of the horſe before the drummer, who, with a variety of ſingular geſtures, beats them with two little iron bars with balls at the end; their ſound is ſofter and more agreeable than that of the common drum, and theſe are oftener uſed in operas, oratorios, tragedies, and concerts. There are divers beats of the drum, as the chamade, charge, march, double march, aſſemblie, retreat, &c.

DRUM, or DUMMER, he that beats the drum, of whom each company of foot has one, and ſometimes two. Every regiment has a drum-major, who has the command over the other drums.

DRUM *of the Ear*, in anatomy. See TYMPANUM.

DRUM, in architecture. See TAMBOUR.

DRUNKENNESS, *Ebrietas*, phyſically conſidered, conſiſts in a preternatural compreſſion of the brain, and a diſcompoſure of its fibres, occaſioned by the fumes or ſpirituous parts of liquors.

DRUPE, among botaniſts, a kind of pericarpium, conſiſting of a ſoft, fleſhy, and ſucculent pulp, with a nucleus, or kernel in its center.

DRY MEAT, in the manege, is uſed for corn and hay. After taking the horſe from graſs he is houſed, and put to dry meat.

DRYADS, *Dryades*, in the heathen theology, a ſort of deities, or nymphs, which the ancients thought inhabited groves and woods. They differed from the Hamadryades; theſe latter being attached to ſome particular tree, with which they were born, and with which they died; whereas the Dryades were goddeſſes of trees and woods in general.

DUCAT, a coin current in Germany and other countries abroad, for the different values of which ſee EXCHANGE.

DUCATOON, a ſilver coin, likewiſe frequent in ſeveral parts of Europe.

DUCK, *Anas*, in ornithology, a genus of birds ſufficiently known.

There are two ſorts of ducks common in England, the tame and wild; the firſt of which is very beneficial to huſbandmen, and at the ſame time requires no charge to keep, living on loſt corn, worms, ſnails, &c. Indeed once a year this fowl is a great layer of eggs; and when ſhe ſits, muſt be carefully fed with barley or other grain. As to the ducklings, they are fed in the ſame manner as goſlings, and may be fattened in three weeks time, by giving them any kind of pulſe or grain, and plenty of water.

DUCT, or DUCTUS, in general, denotes any tube or canal.

It is much uſed by anatomiſts, who mention the adipoſe ducts, concerning the reality of which authors are not agreed; the thoracic, or chyliferous duct; the excretory ducts of the glands; the hepatic duct, or porus bilarius; the ſalival ducts; the lachrymal ducts; the ductus communis choledochus, &c. concerning all which it is to be obſerved, that their uſe is to convey certain animal fluids ſecreted in the glands of the parts to which they ſeverally belong: thus it is, the ſalival ducts diſcharge the ſaliva, or pellucid liquor, ſecreted in the glands of the mouth; and ſo of the reſt.

DUCTILITY, in phyſics, a property of certain bodies, whereby they are capable of being expanded or ſtretched forth, by means of a hammer, preſs, &c.

The vaſt ductility of ſome bodies, eſpecially gold, is very ſurpriſing. See DIVISIBILITY.

DUEL, is a ſingle combat, at a time and place appointed, in conſequence of a cartel or challenge.

The word is derived from the Latin, *duellum*, *quaſi duorum bellum*, a combat between two perſons.

Authoriſed duels were ſuch whoſe motive was the good of their country, when one, or a ſmall number of combatants, were choſen to ſave the blood of a whole army, and decide, by victory or death, the quarrels of kings or whole nations. Thus Goliath and David, the Horatii and Curiatii, and ſeveral others.

Duelling was ſo general a method of determining differences among the nobles, that even eccleſiaſtics were not excuſed; only, to prevent their being ſtained with blood, they procured champions to fight for them. None were excepted from combat, but ſick people, cripples, and ſuch as were under twenty-one years of age, or above ſixty. Juſts and tournaments, doubtleſs, rendered duels more frequent.

We have good proof that duelling was authorized before the Normans came into England, though not ſo frequent and ſolemn as after the Conqueſt. Theſe are, however, now known no longer, and we could wiſh the private practice of duelling was alſo buried in oblivion.

DUKE is either the title of a ſovereign prince, as the duke of Savoy, Parma, &c. the grand duke of Tuſcany, Muſcovy, &c. or it is the title of honour and nobility next below princes.

DULCIFYING, in pharmacy, is the ſweetening, or rendering inſipid, any matter impregnated with ſalts, by waſhing it in pure water.

The word is formed from the Latin, *dulcis*, ſweet, and *facio*, to make.

DULEDGE, in gunnery, a peg of wood which joins the ends of the ſix felloes that form the round of a wheel of a gun-carriage. The plate of iron on the outſide of the wheel, which ſtrengthens the joint, is called the duledge-plate.

DUNG, in agriculture, is of ſeveral ſorts, as of horſes, cows, ſheep, hogs, pigeons, geeſe, hens, &c. All kinds of dung contain ſome matter, which, when mixed with the ſoil, ferments therein, and, by that fermentation, diſſolves the texture of the earth, and divides and crumbles its particles very much. This is the real uſe of dung in agriculture;

for, as to the pure earthy part of it, the quantity is ſo very ſmall, that it bears an extremely inconſiderable proportion to that of the earth it is intended to manure.

DUNGEON, or DONJON, in fortification, is commonly a large tower or redoubt of a fortreſs, whither the garriſon may retreat, in caſe of neceſſity, and capitulate with greater advantage.

DUNG-MEERS, in huſbandry, places where ſoils and dungs are mixed and digeſted together: for this purpoſe it is uſual to dig a pit ſufficient to hold the ſtock of ſoil the huſbandman is capable of making; and to prepare it at the bottom with ſtone and clay, that it may hold water, or the moiſture of the dung; and beſides, it ſhould be ſo ſituated that the ſinks and drips of the houſes and barns may run into it. Into this pit they caſt refuſe fodder, litter, dung, weeds, &c. where they lie and rot together, till the farmer have occaſion for it.

DUO, or DUET, in muſic, a ſong or compoſition to be performed in two parts only; one ſung, and the other played on an inſtrument, or by two voices alone: it is alſo called a duo, when two voices ſing different parts, accompanied with a third, which is a thorough baſs. Uniſons and octaves muſt be rarely uſed in duo's, except at the beginning and end.

DUODENUM, in anatomy, the firſt of the ſmall inteſtines, ſo called becauſe it is about twelve fingers breadth in length. It begins at the right orifice of the ſtomach, then turns towards the ſpine, and ends on the left ſide, where the circumvolutions begin. It is a kind of ſuccedaneous ſtomach; and performs the like functions, as appears from its internal ſtructure, which is the ſame with that of the ſtomach, for the glandulous villoſe coat, out of which their conſtantly diſtils a ſolvent juice in the ſtomach, is continued through the duodenum. Beſides this glandulous coat, the duodenum is furniſhed with innumerable ſmall glands, which, upon the ſeparation of the tunica villoſa, are very conſpicuous in the nervous coat, and which were firſt diſcovered by the famous Brunnerus. Beſides, it has alſo ſome peculiar and remarkable ducts, which diſcharge into its cavity a highly active menſtruum: for the bilious juice runs in a leſs quantity from the gall bladder, but in a larger from the liver and its biliary ducts. In like manner the duct emerging from the pancreatic gland, which is remarkably large, conveys into it a great quantity of lymph of a ſolvent nature: and it is farther obſervable, that theſe two ducts run together in a human body, and their orifices end in a papilla, and are directly placed over the bottom of the flexure of the duodenum, that the liquids conveyed by theſe ducts might deſcend drop by drop on the ſubjacent maſs of chyle. We do not obſerve any lacteals in the duodenum, and conſequently there is no ſuch ſecretion made there, as in the other inteſtines, particularly the jejunum; and for this reaſon the meſentery does not reach to the duodenum, though all the other ſmall inteſtines adhere to it. It is very obſervable, that there is not any animal but what has this flexure of the inteſtine, or little ſuccedaneous ſtomach; and that no animal is without the bilious juice, which is generated in the liver, and poured copiouſly into the duodenum; which manifeſtly proves, that nature has exerted her utmoſt ſkill in faſhioning this part of the body, ſo neceſſary for the preſervation of the life and health of animals.

DUPLE *Ratio*, in mathematics, is when any number or quantity is contained in another twice; as 6 is in a duple ratio to 3.

Sub-DUPLE *Ratio*, in mathematics, is when any number or quantity is contained in another twice; thus 3 is ſaid to be ſub-duple to 6.

DUPLICATE *Ratio*, is a ratio compounded of two ratios; as the duplicate ratio of a to b is the ratio of $a\,a$ to $b\,b$, or the ſquare of a to the ſquare of b.

In a ſeries of geometrical proportionals, the firſt term to the third is ſaid to be a duplicate ratio of the firſt to the ſecond: Thus, in 2, 4, 8, 16, the ratio of 2 to 8 is duplicate to that of 2 to 4; ſo that duplicate ratio is the proportion of ſquare, as triplicate is of cubes, &c. and the ratio of 2 to 8 is ſaid to be compounded of that of 2 to 4, and of 4 to 8.

DUPLICATION is the doubling of any thing, or multiplying of it by 2: it is alſo the folding of any thing back again on itſelf.

DUPLICATION *of the Cube*, is to find the ſide of a cube that ſhall be double in ſolidity to a given cube, which is a famous problem cultivated by the geometricians theſe two thouſand years.

It was firſt propoſed by the oracle of Apollo at Delphos; which, being conſulted about the manner of ſtopping a plague then raging at Athens, returned for anſwer, that the plague ſhould ceaſe when Apollo's altar, which was cubical, ſhould be doubled. Upon this, they applied themſelves, in good earneſt, to ſeek the duplication of the cube, which hence-forward was called the Delian problem.

The ſolution of this problem depends upon finding two mean proportionals between two given lines: for if the ſide of a given cube be $= a$, and the ſide of a double cube be $= y$, then will $2a^3 = y^3$; or putting $b = 2a$, it will be $a\,a\,b = y^3$; therefore it will be $a\,a : y\,y :: y : b$; or, making $z = \frac{y\,y}{a}$, it will be $a : z :: y : b$; ſo that theſe four quantities will be continual proportionals: conſequently y, the ſide of the cube ſought, is the ſecond of two mean proportionals between a and b.

DUPLICATURE, among anatomiſts, is the doubling of any membranes, when they run off to ſome diſtance, and return again.

DUPONDIUS, in antiquity, the weight of two pounds;

pounds; alſo a piece of money equal to two as's in value.

The word is derived from the Latin, *duo*, two, and *pondo*, a pound weight.

DURA MATER, in anatomy, one of the membranes, or meninges, as they are called, which ſurround the brain. See the article *Dura* MATER.

DURATION, an idea which we get by attending to the fleeting and perpetually periſhing part of ſucceſſion; the idea of ſucceſſion being acquired by reflecting on that train of ideas which conſtantly follow one another in our minds, as long as we are awake. The ſimple modes of duration are any different lengths of it whereof we have diſtinct ideas; as hours, days, years, time, eternity, &c.

DURATION, as marked by certain periods and meaſures, is what we moſt properly call time. See the article TIME.

DURATION *of Action*, according to Ariſtotle, is confined to a natural day in tragedy; but the epopea, according to the ſame critic, has no fixed time.

DUTCHY, in geography, an appellation given to the dominions of a duke. See the article DUKE.

DUTCHY-COURT, a court of the dutchy-chamber of Lancaſter, held at Weſtminſter, before the chancellor of the ſame, for matters concerning the lands and franchiſes of that dutchy.

DUTY, in general, denotes any thing that one is obliged to perform.

DUTY, in polity and commerce, ſignifies the impoſt laid on merchandizes, at importation or exportation, commonly called the duties of cuſtoms; alſo the taxes of exciſe, ſtamp-duties, &c.

DUTY, in the military art, is the exerciſe of thoſe functions that belong to a ſoldier.

DUUMVIRATE, the office or dignity of the duumviri.

The duumvirate laſted till the year of Rome 388, when it was changed into decemvirate.

DWAL, in heraldry, the herb night-ſhade, uſed by ſuch as blazon with flowers and herbs, inſtead of metals and colours, for ſable or black.

DYE, in architecture, any ſquare body, as the trunk, or notched part of a pedeſtal, or it is the middle of the pedeſtal, or that part included between the baſe and the corniche, ſo called becauſe it is often made in the form of a cube or dye.

DYEING, the art of giving a laſting colour to ſilks, cloths, and other ſubſtances, whereby their beauty is much improved, and value enhanced.

The art of dyeing may be divided into as many branches as there are different colours to be communicated, and ſorts of different ſtuffs to be ſubjects of it.

DYEING of cloths, ſerges, druggets, and other woollen manufactures. For black, in cloths and ſtuffs of price, it is begun with a ſtrong decoction of woad and indigo, which give a deep blue; after which, the ſtuffs, being boiled with alum and tartar, or pot-aſhes, are to be maddered with common madder; then dyed black with Aleppo galls, copperas, and ſumac; and finiſhed by back boiling in weld. Scarlet is dyed with kermes and cochineal, with which may alſo be uſed agaric and arſenic. Crimſon-ſcarlet is given with cochineal-meſtich, aqua fortis, ſal armoniac, ſublimate, and ſpirit of wine. Violet, ſcarlet, purple, amaranth, and panſy-ſcarlet, are given with woad, cochineal, indigo, braziletto, brazil, and orchal. For common red, pure madder is uſed, without other ingredients. Crimſon-reds, carnations, flame, and peach-colours, are dyed, according to their ſeveral hues, with cochineal-meſtich, without madder, or the like. Crimſon-red is prepared with Roman alum, and finiſhed with cochineal. Peach-colour muſt be back boiled a little with galls and copperas, or the like. Orange aurora or golden yellow, brick-colour, and onion-peel colour, are given with woad and madder, tempered according to their reſpective ſhades. For blues, the dark are given with ſtrong tincture of woad: the brighter with the ſame liquor, as it weakens in working. Dark browns, minims, and tan-colours, are given with woad, weaker in decoction than for black, with alum and pot-aſhes; after which, they are maddered higher than black: for tan-colours, a little cochineal is added. Pearl-colours are given with galls and copperas; ſome are begun with walnut-tree roots, and finiſhed with the former; though, to make them more ſerviceable, they dip them in a weak tincture of cochineal. Greens are begun with woad, and finiſhed with weld. Pale-yellows, lemon-colours, and ſulphur-colours, are given with weld only. Olive-colours of all degrees are firſt put in green, and taken down again with ſoot, more or leſs, according to the ſhade required. Feuilemont, hair colour, muſk, and cinnamon-colour, are given with weld and madder. Nacarat, or bright orange-red, is given with weld and goats-hair, boiled with pot-aſhes. Fuſtic here is forbid, as a falſe colour.

DYEING *of Wools for Tapeſtry* is performed after the ſame manner as cloths, excepting blacks, which are only to be woaded, and then put in black as above.

Black wools for cloths and ſerges may be begun with walnut-tree root, and walnut rinds, and finiſhed by dipping in a vat of black.

DYEING *of Silks* is begun by boiling them with ſope, &c. then ſcowering and waſhing them out in the river, and ſteeping them in alum-water cold. For crimſon they ſcour them a ſecond time before putting them in the cochineal vat.

Red-crimſon is dyed with pure cochineal-meſtich, adding galls, turmeric, arſenic, and tartar, all put together in a copper of fair water almoſt boiling: with theſe the ſilk is to be boiled an hour and an half; after which, it is ſuffered to ſtand in the liquor till

next day. Violet-crimſon is alſo given with pure cochineal, arſenic, tartar, and galls; but the galls in leſs proportion than in the former: when taken out, it is to be well waſhed, and put in a vat of indigo. Cinnamon-crimſon is begun like the violet, but finiſhed by back-boiling, if too bright, with copperas; if dark, with a dip in indigo. Light-blues are given in a vat of indigo. Sky-blues are begun with orchal, and finiſhed with indigo: for citron-colours, the ſilk is firſt alumed, then welded, with a little indigo. Pale yellows, after aluming, are dyed in weld alone. Pale and brown auroras, after aluming, are welded ſtrongly, then taken down with rocou diſſolved with pot-aſhes. Flame-colour is begun with rocou, then alumed, and dipped in a vat or two of brazil. Carnation, and roſe-colours, are firſt alumed, then dipped in brazil. Cinnamon-colour, after aluming, is dipped in brazil and braziletto. Lead-colour is given with ſuſtic, or with weld, braziletto, galls, and copperas. But the galls, on theſe and other occaſions, are not to be uſed, becauſe they increaſe the weight to the damage of the purchaſer; for which reaſon, it is puniſhed in France as a fraud: in reality, few but black ſilks need galls.

Black ſilks, of the coarſer ſorts, are begun with ſcowering them with ſoap, as for other colours; which done, they are waſhed out, wrung, and boiled an hour in old galls, where they are left to ſtand a day or two; after which they are waſhed again with fair water, wrung, and put in another vat of new and fine galls; then waſhed and wrung again, and finiſhed in a vat of black. Fine black ſilks are only put once into galls, viz. the new and fine ſort, which has only boiled an hour; then they are waſhed, and wrung out, and dipped thrice in black, to be afterwards brought down by back boil-with ſoap.

DYEING *of Thread* is begun with ſcowering it in lye of good aſhes; after which it is wrung, rinſed out in river water, and wrung again. For a bright blue, it is given with braziletto and indigo. Bright green is firſt dyed blue, then back-boiled with braziletto and verdeter, and laſtly woaded. For a dark green, it is given like the former, only darkened more before woading. Lemon, or pale yellow, is given with weld, mixed with rocou. Orange and iſabella, with ſuſtic, weld, and rocou. Red, both bright and dark, with flame colour, &c. are given with brazil, either alone, or with a mixture of rocou. Violet, dry roſe, and amaranth, are given with brazil, taken down with indigo. Feulemort, and olive-colour, are given with galls and copperas, taken down with weld, rocou, or ſuſtic. Black is given with galls and copperas, taken down and finiſhed with braziletto wood.

DYEING *of Hats* is done with braziletto, galls, copperas, verdigriſe, diſſolved and boiled in a copper, capable of receiving, beſides the liquor, twelve dozen of hats on their blocks, or moulds. Here the hats are ſuffered to boil ſome time; after which they are taken out, and ſuffered to ſtand and cool; then dipped in again; and thus alternately, oftener or ſeldomer, as the ſtuff is of a nature to take the dye with more or leſs difficulty.

Proof of DYES.—There are divers ways of proving the truth of dyes, or examining the juſtneſs and legitimacy of their compoſition. To diſcover whether a cloth has been duly treated by the dyer, and the proper foundation laid, a white ſpot, by the French called roſette, of the bigneſs of a ſhilling, ought to be left; beſides a white ſtripe between the cloth and the liſt.

Farther proof is had by boiling the dyed ſtuff in water, with other ingredients, different according to the quality of the dye to be proved. If the colour ſuſtain the teſt, i. e. do not diſcharge at all, or very little, ſo that the water is not tinctured by it, the dye is pronounced good: otherwiſe, falſe.

DYEING *of Leather, Skins, &c.*—Blue is given by ſteeping the ſubject a day in urine and indigo, then boiling it with alum: or it may be given by tempering the indigo with red wine, and waſhing the ſkins therewith. Red is given by waſhing the ſkins, and laying them two hours in galls, then wringing them out, dipping them in a liquor made with liguſtrum, alum, and verdigriſe in water; and laſtly, in a dye made of brazil wood, boiled with lye. Purple is given by wetting the ſkins with a ſolution of roche alum in warm water, and, when dry again, rubbing them with the hand with a decoction of log-wood in colder. Green is given by ſmearing the ſkin with ſap-green and alum-water boiled: to darken the colour, a little more indigo may be added. Dark-green is alſo given with ſteel filings and ſal armoniac ſteeped in urine till ſoft, then ſmeared over the ſkin; which is to be dried in the ſhade. Sky-colour is given with indigo ſteeped in boiling water, and the next morning warmed and ſmeared over the ſkin. Yellow, by ſmearing the ſkin over with aloes and linſeed-oil diſſolved and ſtrained: or by infuſing it in weld. Orange-colour is given by ſmearing with ſuſtic-berries boiled in alum water: or, for a deep orange, with turmeric.

DYEING, or STAINING, *of Wood for inlaying, veneering, &c.*—Red is done by boiling the wood in water and alum; then taking it out, adding brazil to the liquor, and giving the wood another boil in it. Black, by bruſhing it over with log-wood boiled in vinegar, hot: then waſhing it over with a decoction of galls and copperas, till it be of the hue required. Any other colour may be given by ſqueezing out the moiſture of horſe-dung through a ſieve, mixing it with diſſolved roche alum and gum-arabic; and to the whole adding green, blue, or any other colour deſigned: after ſtanding two or three days, pear-tree, or other wood, cut to the thickneſs

neſs of half-a-crown, is put into the liquor boiling hot, and ſuffered to remain till it be ſufficiently coloured.

DYEING *of Bone, Horn, or Ivory*—Black is performed by ſteeping braſs in aqua-fortis till it be returned green: with this the bone, &c. is to be waſhed once or twice; then put in a warmed decoction of log-wood and water. Green is begun by boiling the bone, &c. in alum-water; then with verdigriſe, ſal ammoniac, and white-wine vinegar; keeping it hot therein till ſufficiently green. Red is begun by boiling it in alum-water, and finiſhed by decoction in a liquid compounded of quick-lime ſteeped in rain-water, ſtrained, and to every pint an ounce of brazil-wood added. In this decoction the bone, &c. is to be boiled till ſufficiently red.

DYEING, or STAINING, *Horn to imitate Tortoiſe-Shell.*—The horn to be dyed muſt be firſt preſſed into proper plates, ſcales, or other flat form; and the following mixture prepared.

"Take of quick-lime two parts, and of litharge one part; temper them together to the conſiſtence of a ſoft paſte with ſoap-lye." Put this paſte over all the parts of the horn, except ſuch as are proper to be left tranſparent, in order to give it a nearer reſemblance of the tortoiſe-ſhell. The horn muſt remain in this manner covered with the paſte till it be thoroughly dry; when the paſte being bruſhed off, the horn will be found partly opaque and partly tranſparent, in the manner of tortoiſe-ſhell; and when put over a foil, of the kind of latten, called aſſidue, will be ſcarcely diſtinguiſhable from it. It requires ſome degree of fancy and judgment to diſpoſe of the paſte in ſuch a manner as to form a variety of tranſparent parts, of different magnitudes and figures, to look like the effect of nature; and it will be an improvement to add ſemi-tranſparent parts: which may be done by the mixing whiting with ſome of the paſte to weaken its operation in particular places; by which ſpots of a reddiſh brown will be produced, which, if properly interſperſed, eſpecially on the edges of the dark parts, will greatly increaſe both the beauty of the work, and its ſimilitude with the real tortoiſe-ſhell.

DYEING, or STAINING, *Paper or Parchment yellow*—Paper may be ſtained yellow by the tincture of French berries, prepared by boiling them in water with a little alum: but a much more beautiful yellow may be obtained by uſing the tincture of turmeric, formed by infuſing an ounce or more of the root, powdered, in a pint of ſpirit of wine. This may be made to give any teint of yellow, from the lighteſt ſtraw to the full colour called French yellow; and will equal in brightneſs the beſt dyed ſilks. If yellow be wanted of a warmer or redder caſt, annotto, or dragon's-blood, muſt be added to the tincture.

The beſt method of uſing theſe, and the following tinctures, is to ſpread them even on the paper or parchment by means of a broad bruſh in the manner uſed in varniſhing.

DYEING, or STAINING, *Paper, or Parchment, red.*—Paper or parchment may be ſtained red with the common red ink. It may be ſtained of a ſcarlet hue by tincture of dragon's-blood in ſpirit of wine; but this will not be bright.

A very fine crimſon ſtain may be given to paper, by a tincture of the Indian lake; which may be made by infuſing the lake ſome days in ſpirit of wine; and then pouring off the tincture from the dregs.

DYEING, or STAINING, *Paper, or Parchment, green.*—Paper, or parchment, may be ſtained green by a ſolution of verdigriſe in vinegar; or by the cryſtals of verdigriſe diſſolved in water. As alſo by the ſolution of copper in the aqua-fortis, made by adding filings of copper gradually to the aqua-fortis, till no ebullition enſues; or ſpirit of ſalt may be uſed in the place of aqua-fortis.

DYEING, or STAINING, *Paper, or Parchment, blue.*—A blue colour may be given to paper or parchment by ſtaining it green by any of the above methods, and then bruſhing it over with a ſolution of pearl-aſhes. It may alſo be done by a ſolution of indigo procured at the dyers.

DYEING, or STAINING, *Paper, or Parchment, orange.*—Stain the paper or parchment of a full yellow, by means of the tincture of turmeric as above directed; then bruſh it over with a ſolution of fixed alkaline ſalt, made by diſſolving half an ounce of pearl-aſhes, or ſalt of tartar, in a quart of water, and filtering the ſolution.

DYEING, or STAINING, *Paper, or Parchment, purple.*—Paper or parchment may be ſtained purple by orchal; or by a tincture of log-wood. The juice of ripe privet-berries, expreſſed, will alſo give a purple dye to paper or parchment.

DYKE, or DIKE. See the article DIKE.

DYNASTY, among ancient hiſtorians, ſignifies a race or ſucceſſion of kings of the ſame line or family: ſuch were the dynaſties of Egypt.

DYSCRACY, among phyſicians, denotes an ill habit or ſtate of the humours, as in the ſcurvy, jaundice, &c.

DYSENTERY, in medicine, an exulceration of the inteſtines, attended in the beginning with an execretion of a biting, bilious humour, afterwards with abraſions of the inteſtines, and, at laſt, blood in moderate quantities is voided.

The word is derived from the Greek, δυς, importing difficulty, and εντερα, the inteſtines.

When this diſeaſe is attended with a bloody flux and ſevere gripes, the inteſtines are commonly ulcerated, and diſcharge blood; which comes away, ſometimes with liquid excrements, ſometimes with ſlime accompanied with fleſhy particles. The patient is ſeized with frequent irritations to ſtool, and a pain of the

anus; he discharges but little at a time, and his pain is increased by every stool; and as this disease arises from an inflammation, there is always some degree of fever with it.

Wherefore, to come to a cure, the first thing to be done is to draw blood: then a vomit to be given, for which ipecacuanha wine is very proper, and to be repeated two or three times every third or fourth day.

During this course, and afterward, medicines proper for stopping the flux and healing the ulcerated membranes are to be administered: and of this sort I know none better than the following bolus, composed of the cordial confection and French bole, each one scruple; Thebaic extract, one grain, given three times a day.

And it will be of service to inject clysters, either of fat broth, with the addition of Venice-treacle or electuary of scordium, or of the white decoction and starch; or, in place of this last, of the chalk julep, with two or three grains of the Thebaic extract, when occasion requires it. Lastly, I recommend an useful remark, that this course is sometimes rendered ineffectual by a bad habit of body. In such cases, to the foregoing method it will be proper to add medicines which correct the humours; and indeed some doses of the rhubarb, with a small proportion of dulcified mercury sublimate, commonly called calomel, will prove very conducive to that end.

Besides these diseases, a vomica, or internal suppuration, is sometimes formed in the stomach. This indeed seldom happens, but yet I have observed it more than once, when the patient vomited up a mixture of blood and purulent matter in large quantities.

The case is terrifying indeed; but yet, generally speaking, it is not attended with any greater danger; and it is cured by medicines which heal the ulcerated membranes, especially Locatelli's balsam. *Mead's Monita et Præcepta.*

DYSOREXY, among physicians, denotes a want of appetite, proceeding from a weakly stomach. See APPETITE.

DYSPEPSY, in physic, a difficulty of digestion; or rather a depraved digestion, when the aliments in the stomach, for want of a due strength in the digestive organs, follow their spontaneous tendency, and contract an alkaline or acid putrefaction.

The word is formed from the Greek, δυς, importing difficult, or bad, and πεπτω, to correct.

DYSPNOEA, in physic, a difficulty of breathing.

The word is derived from the Greek, δυς, difficulty, and πνεω, to breathe.

A difficulty of breathing may be caused by any thing that can affect any part of the thorax, particularly the heart, large arteries, and lungs, by crude tubercles, vomica's, polypuses, and several other disorders.

DYSURIA, in medicine, a difficullty of making urine, attended with a sensation of heat and pain.

The word is derived from the Greek, δυς, importing painful, and ουρον, urine.

This disease is distinguished from a strangury, as, in the latter, the urine is voided by only a drop, as it were, at a time, but, however, with pain; and from an ischury, as in this disorder, there is an almost total suppression of urine.

DYTISCUS, water-beetle, in zoology, a genus of insects of the order of the coleoptera, the antennæ of which are slender and setaceous, and their feet formed for swimming. See COLEOPTERA.

Authors enumerate a great many species of this animal, among which is the great water-beetle, the largest of all European beetles, being an inch and an half in length, and all over of a deep and somewhat glossy black.

E.

EAG

E, The second vowel, and fifth letter of the alphabet. The letter E is most evidently derived from the old character ∃ in the ancient Hebrew and Phœnician alphabets, inverted by the Greeks to this position E, and not from the Hebrew He ה. From the same origin is also derived the Saxon *e*, which is the first letter in their alphabet that differs from the Latin one. It is formed by a narrower opening of the larynx than the letter A; but the other parts of the mouth are used nearly in the same manner as in that letter.

It has a long and short sound in most languages: the short sound is audible in *bed*, *fret*, *den*, and other words ending in consonants: its long sound is produced by a final *e*, or an *e* at the end of words, as in *glebe*, *here*, *hire*, *scene*, *sphere*, *interfere*, *revere*, *sincere*, &c. in most of which it sounds like *ee*; as also in some others by coming after *i*, as in *believe*, *chief*, *grief*, *reprieve*, &c. and sometimes this long sound is expressed by double *ee*, as in *bleed*, *beer*, *creed*, &c. Sometimes the final *e* is silent, and only serves to lengthen the sound of the preceding vowel, as in *rag*, *rage*, *flag*, *flage*, *hug*, *huge*, &c. The sound of *e* is obscure in the following words, *oxen*, *heaven*, *bounden*, *fire*, *aire*, *massacre*, *maugre*, &c.

The Greeks have their long and short *e*, which they call Epsilon and Eta. The French have at least six kinds of *e*'s: the Latins have also a long and short *e*; they also write *e* instead of *a*, as *dicem* for *dicam*, &c. and this is, no doubt, the reason why *a* is so often changed into *e*, in the præter tense, as *ago*, *egi*; *facio*, *feci*, &c. E was also a numeral letter standing for 250, according to the verse,

E quoque ducentos et quinquaginta tenebit.

EAGLE, *Aquila*, in ornithology, the English name of several species of the falcon kind. See the article FALCON.

In heraldry, the eagle is accounted one of the most noble bearings in armoury, and according to the learned in this science, ought to be given to none but such as greatly excel in the virtues of generosity and courage, or for having done singular services to their sovereigns; in which cases they may be allowed a whole eagle, or an eagle naissiant, or only the head or other parts thereof, as may be most agreeable to their exploits.

EAR

EAGLE, *Aquila*, in astronomy. See AQUILA.

EAGLE, in architecture, a figure of that bird anciently used as an attribute of Jupiter, in the capitals and friezes of the columns of the temples consecrated to that god.

EAGLE-STONE, *Ætites*, in natural history. See the article ÆTITES.

Black EAGLE, an order of knighthood, instituted by the elector of Brandenburgh, in 1701, on his being crowned king of Prussia.

The knights of this order wear an orange coloured ribbon, suspending a black eagle.

White EAGLE, a like order in Poland, instituted in 1325, by Uladislaus V. on occasion of the marriage of his son Casimir to the daughter of the great duke of Lithuania.

The knights of this order wear a chain of gold, suspending a silver eagle, crowned.

White EAGLE is also a term used by chemists for mercurius dulcis.

EAGLET, a diminutive of eagle, properly signifying a young eagle. In heraldry, when there are several eagles on the same escutcheon, they are termed eaglets.

EALDERMAN, or EALDORMAN, the same with alderman. See ALDERMAN.

EAR, *Auris*, in anatomy, the organ of hearing.

Anatomists generally distinguish the ear into external and internal; the greatest part of the external ear consists of a large cartilage, which is the basis of all the other parts. There are two portions, the one large and solid, called pinna, which is the superior part; the other small and soft, called the lobe, which makes the lower part. We may likewise consider two sides in the outward ear, one turned obliquely forward, and irregularly concave; the other turned obliquely backward, and unequally convex; the forefide is divided into four eminences and as many cavities; the first eminence is in the helix, which is the large folded border, or circumference of the great portion of the ear: the second is the anthelix, which is the large oblong eminence surrounded by the helix: the third is the tragus, which is the smaller anterior protuberance below the anterior extremity of the helix: the fourth is the antitragus, which is the posterior tubercle below the inferior extremity of the anthelix.

The

The firſt cavity is the hollow of the helix; the ſecond is the depreſſion at the ſuperior extremity of the anthelix, called foſſa navicularis; the third is the concha, or great double cavity, that lies under the anthelix, the upper bottom of which is divided from the lower by a continuation of the helix, like a tranſverſe criſta; and, laſtly, the meatus of the external ear at the bottom of the concha.

The backſide of the ear has only one conſiderable eminence, which is a portion of the convex ſide of the concha, the other portion being hid by the adheſion of the ear to the os temporis.

The external ear is fixed to the cranium by muſcles, or rather ligaments. The ſkin is a continuation of that which covers the neighbouring parts of the temporal region. The arteries of the external ear come anteriorly from the arteria temporalia, and poſteriorly from the occipitalis. The veins are branches of the jugularis externa. The portio dura of the auditory nerve gives off a branch which runs up behind the ear, to the backſide of which it ſends ſeveral filaments; and the trunk of the branch ſends likewiſe filaments to the meatus and foreſide of the ear. The ſecond vertebral pair ſends alſo a branch to the ear, the ramifications of which communicate with thoſe of the other.

The internal ear conſiſts chiefly of ſeveral bony pieces, which may be divided into four general parts; the external meatus auditorius; the tympanum, or barrel of the ear; the labyrinth; and the internal meatus auditorius; or it may be divided into immoveable or containing parts, which take in all the four already mentioned; and moveable or contained parts, which are four little bones lodged in the tympanum, called incus, malleus, ſtapes, and os orbiculare, or lenticulare.

The external auditory paſſage is about half an inch in length, running obliquely from behind forward: its cavity is almoſt oval, wider at the entry than at the middle, after which it widens again by degrees: it terminates inwardly by an even circular edge, the upper part being outward, and the lower part inward. The concave ſide of this edge is grooved quite round.

The tympanum is an irregularly hemiſpherical cavity, the bottom of it being turned inward, and the mouth joined to the circular groove. It has three remarkable eminences; the firſt is a large tuberoſity lying in the very bottom of the barrel; a ſmall irregular pyramid ſituated about the tuberoſity, the apix of which is perforated, and on one ſide of the baſis two ſmall bony filaments are often found parallel. In the third eminence is a cavity ſhaped like the mouth of a ſpoon, ſituated a little towards the anterior part of the bottom of the barrel; and at a very ſmall diſtance from its point is a little bony ridge. The principal cavities in the tympanum are the opening of the maſtoid cells, the opening of the Euſtachian tube, the bony half-canal, the fenеſtra ovalis and rotunda, and the ſmall hole in the pyramid.

The incus or anvil may be divided into body and branches; the body is a large ſubſtance turned forward; the branches are two; one long turned downward, the other ſhort turned backward. The malleus is a long bone with a large head, a ſmall neck, and two apophyſes, one in the neck, the other in the handle. The ſtapes is a ſmall bone, ſo denominated from its reſemblance to a ſtirrup; it is divided into the head, legs, and baſis. The orbicular or lenticular bone lies between the head of the ſtapes and extremity of the long leg of the incus, being articulated with each of theſe.

The labyrinth is divided into three parts; the anterior, called cochlea; the middle, termed veſtibulum; and the poſterior; the labyrinth, in particular, comprehends the three ſemi-circular canals: the cochlea is a ſort of ſpiral ſhell, with two ducts, formed in the anterior part of the apophyſis petroſa, like the ſhell of a ſnail. The parts to be diſtinguiſhed in it are the baſis, the apex, the ſpiral lamina, or half-ſeptum, by which its cavity is divided into two half-canals, the ſpindle round which the cochlea turns, and laſtly, the orifice and union of the two ducts. The veſtibulum is an irregularly round cavity, leſs than the tympanum, and ſituated more inward, and a little more forward. The ſemi-circular canals are three in number; one vertical and ſuperior; one vertical and poſterior; and one horizontal.

The internal auditory hole is the backſide of the apophyſis petroſa, in ſome meaſure behind the veſtibulum and baſis of the cochlea. It is a kind of blind hole, divided into two foſſulæ; one large, the other ſmall. The large one lies loweſt, and ſerves for the portico mollis of the auditory nerve: the ſmall one is uppermoſt, and is the opening of a ſmall duct, through which the portico dura of the ſame nerve paſſes, To this latter duct Fallopius gave the name of aqueduct.

The other parts of the ear are principally the membrana tympani, the perioſteum of the barrel, the membrana maſtoidæa interna, the muſcles of the officula, the parts which complete the formation of the Euſtacian tube, the arteries, veins, and nerves.

To begin with the Euſtachian tube, otherwiſe called ductus auris palatinus, and in France generally the aqueduct, which is not to be confounded with the aquæductus Fallopii: this duct reaches from the cavity of the barrel to the root of the internal ala of the apophyſis pterygoides; it is made up of two portions, one entirely bony, and the other partly bony, partly cartilaginous, and partly membranous. The Euſtachian tube is furniſhed with three muſcles, according to Valſalva; the pterygoſtaphylinus, the ſphenopterygopalatinus, and the palatoſalpingæus, ſince called by ſome, muſculus tubæ novus Valſalvæ; its uſe is to dilate and keep

open

open this channel, as Valſalva firſt has moſt ingeniouſly obſerved.

The membrana tympani is a thin, tranſparent, flattiſh pellicle, whoſe edge is round, and ſtrongly fixed in the orbicular tube. The perioſteum of the tympanum produces that of the ſmall bones; it is likewiſe continued over the two feneſtræ, and enters the Euſtachian tube. The cellulæ maſtoidææ are very irregular cavities in the ſubſtance of the maſtoid apophyſis, which communicate with each other, and have a common opening towards the inſide, and a little above the poſterior edge of the orbicular groove.

The ligaments of the officula come next in order: the incus is tied by a ſtrong ſhort ligament fixed in the point of the ſhort branch to the edge of the maſtoid opening. Between the incus and malleus we find a ſmall ſhort cartilage. The malleus is connected through the whole length of its handle, to the inſide of the membrana tympani. The malleus has three muſcles; one external, attributed to Caſſerius, and mentioned by Fabricius ab Aquapendente, is a thin faſciculus of fleſhy fibres, lying along the upper-part of the meatus auditorius, between the perioſteum and other integuments. The ſecond muſcle of the malleus is the anterior, called by Du Verney the external; it is fleſhy, long, and thin. It adheres very cloſely throughout to the Euſtachian tube; it is partly accompanied by a nerve which forms what is called the chorda tympani.

The third muſcle of the malleus is internal; it is very fleſhy and diſtinct, lying partly on the cartilaginous, and partly on the bony portion of the Euſtachian tube, and fixed by one extremity in the apophyſis petroſa; afterwards it runs along the cavity of the bony half-canal of the tympanum, where it is inveſted by a portion of the membranous or ligamentary vagina. The muſcle of the ſtapes is ſhort and thick, and lies concealed within the ſmall bony pyramid at the bottom of the tympanum. The three parts of the labyrinth are lined by a fine perioſteum, which is continued over all the ſides of their cavities, and ſhuts the two feneſtræ of their tympanum. Through the whole extent of the perioſteum of the internal ear, eſpecially the officula, ſemi-circular canals, and half-canals of the cochlea, we diſcover a vaſt number of blood veſſels. The arteries come partly from the internal carotid, and partly from the arteria baſilaris, the ſmall capillary ramifications of which may be obſerved to accompany the auditory nerve through the internal foramen auditorium. *Winſlow.*

EAR, among gardeners, a name given to the leaves that firſt appear from the ſeed, which differ conſiderably from other leaves.

EAR-WIG, *forficula*, in zoology. See the article FORFICULA.

EARL, a Britiſh title of nobility, next below a marquis, and above a viſcount. Earls were anciently called comites, becauſe they were wont *comitari regem*, to wait upon the king for counſel and advice.

EARL *Marſhal of England*, is a great officer who had anciently ſeveral courts under his juriſdiction, as the court of chivalry, and the court of honour. Under him is alſo the herald's office or college of arms. He hath ſome pre-eminence in the court of Marſhalſea, where he may ſit in judgment againſt thoſe who offend within the verge of the king's court. This office is of great antiquity in England, and anciently of greater power than now; and has been for ſeveral ages hereditary in the moſt noble family of Howard.

EARTH, in geography, this terraqueous globe whereon we live, conſiſting of land and water.

That the earth is nearly ſpherical may be ſhewn by the following obſervations. 1. When we are at ſea on board a ſhip, we may be out of ſight of land, when the land is near enough to be viſible, if it were not hid from our eye by the convexity of the water; thus let A B C D (Plate XLI. *fig.* 8.) repreſent part of the globe of the earth; let M be the top of a mountain; this cannot be ſeen by a perſon on board a ſhip at B, becauſe a line drawn from M to his eye at E is intercepted by the convexity of the water: but let the ſhip come to C, and then the mountain will be viſible, becauſe a line may be drawn from M to his eye at F. 2. The higher the eye is, the farther will the view be extended: it is very common for ſailors from the top of the maſt of a ſhip to diſcover land or ſhips at a greater diſtance than they can do when they ſtand upon deck: thus (*fig.* 9.) the top of the tower D may be ſeen from B, the top of the maſt, when it cannot be ſeen from A, by reaſon of its being hid by the convexity of the water. 3. When we ſtand upon the ſhore, the higheſt part of a ſhip is viſible at the greateſt diſtance: if a ſhip is going from us out to ſea, we ſhall continue to ſee the maſt, after the hull or body of the ſhip diſappears, and the top of the maſt will continue to be ſeen longeſt; if a ſhip be coming towards us, the top of the maſt comes firſt into view, and we ſee more and more of it, till at laſt the hull appears: thus let the eye be at C, when a ſhip is as far off as at F, only the top of the maſt is viſible, the hull is hid behind the water; when the ſhip is nearer, as at E, the hull may alſo then be ſeen. If the ſurface of the ſea were a flat, (*fig.* 10.) a line might be drawn from any object ſituated upon it, as the ſhip D, to the eye, whether placed high or low, at A or B: in this caſe, any object upon the earth or ſea would be viſible at any diſtance which was not ſo great as to make the appearance of it too faint, or the angle under which it appears too ſmall, to be ſeen by us: an object would be viſible at the ſame diſtance, whether the eye were high or low: not the higheſt

but the largeſt objects would be viſible to the greateſt diſtance, ſo that we ſhould be able to ſee the hull of a ſhip further off than the maſt: all which is contrary to experience. 4. The convexity of the water may be ſeen upon any ſtill water, as upon a river which is extended in a ſtraight line, a mile or two in length; a little boat upon the water may be ſeen, at a mile diſtance, by a man whoſe eye is any height above the water: but if he ſtoops down and lays his eye near the water, he will find the ſurface thereof riſing up in ſuch a manner as to cover the boat, and intercept his view of it. 5. Several navigators have ſailed quite round the globe; not in an exact circle, for this the winding of the ſhores, the land running out in many places into the ſea, would not admit of; but going in and out, as the ſhores happen to lie, they have held on the ſame courſe, and come home on a different ſide from that they firſt ſet out from: thus, Ferdinand Magellan, ſetting out on the weſt-ſide of Spain, continued ſailing weſtward till he returned home on the eaſt-ſide of Spain; our Sir Francis Drake, Capt. Dampier, Lord Anſon, and others, have done the like; the courſe they have ſome of them run is marked upon ſeveral maps and globes: theſe proofs are ſufficient to evince the roundneſs of the water. That the earth is alſo round is evident, if we conſider that the ocean is diffuſed all over the globe, ſo as to divide the earth, as it were, into large iſlands; and that the ſurface of the earth is not very much higher than the ſea, is evident, from the courſe of rivers, which at a moderate eſtimate are computed to have not above one mile fall in running a thouſand miles, and have their ſhores much of the ſame height; as alſo from the height of mountains, which are none of them found to be above three or four miles higher than the ſurface of the ſea: theſe experiments prove the earth and ſea to have a convex ſurface every-where. 6. All the appearances of the heaven, both at land and ſea, were the ſame as they would be if the earth were a globe, which proves it to be of that ſhape; and laſtly, in eclipſes of the moon, which are cauſed by the ſhadow of the earth falling upon the moon, as will appear under the article ECLIPSE. This ſhadow is always circular, whatever ſituation the earth is in at that time: now a body can be no other than a globe, which, in all ſituations, caſts a circular ſhadow: it is true the ſurface of the earth is not an exact geometrical globe, becauſe it ſinks into vallies in ſome places, and riſes into mountains in others; but theſe inequalities upon its ſurface are as inconſiderable, when compared with the magnitude of the earth, as the little aſperities upon the rind of an orange are to the bulk of the orange; and accordingly we find that mountains and vallies upon the ſurface of the earth cauſe no irregularities in its ſhadow in a lunar eclipſe, but the circumference thereof are even and regular, as if it were caſt by a body exactly globular: the diameter of the earth is about 8000 Engliſh miles; the higheſt mountain is not four miles higher than the ſurface of the ſea, which is about a 2000th part of the earth's diameter: thus it appears that the higheſt mountain bears no greater proportion to the bulk of the earth than a grain of duſt does to a common globe.

But, though the earth be ſpherical, yet it is not a true ſphere, but an oblate ſpheroid, flatted towards the poles; that is, the axis of the earth is not ſo long as the diameter of the equator. This was diſcovered by the following accident:

In 1672, M. Richer, going to Cayenne, in order to make aſtronomical obſervations, found, that his pendulum clock, which at Paris had been regulated to the mean motion of the ſun, when carried to this iſland, which is about five degrees diſtant from the equator, loſt every day two minutes and twenty-eight ſeconds. At his return he reported this experiment, and, as it ſeemed to be of ſome importance, it immediately engaged the attention of the greateſt mathematicians.

But they preſently perceived that the ſlowneſs of the pendulum muſt proceed from a diminution of the preſſure of gravity; and, conſequently, that the preſſure of gravity was leſs at Cayenne than at Paris: for, when a pendulum of a clock departs in its motion from its perpendicular, the forces which cauſes it to return is gravity; whence it follows, that the greater the degree of gravity is, the quicker its motion will be, and *vice verſa*: and, as the motion of the pendulum was ſlower at Cayenne than at Paris, the preſſure of gravity muſt be leſs. Indeed, in warm climates all rods of metal will lengthen, whence the rod of the pendulum muſt be ſomewhat longer at Cayenne than at Paris; and, conſequently, its oſcillations ſlower. But as we know in what proportion heat will lengthen pendulums, and, conſequently, how much it retards their motion, we are ſatisfied that the heats at Cayenne are not ſufficient to ſolve this phœnomenon; but it muſt, in general, flow from a diminution in the preſſure of gravity.

But from whence could proceed the cauſe of this diminution of gravity? Undoubtedly from this: every body, or particle of matter, that deſcribes a circle round a center, makes a continual effort to recede from the center. It is this force that ſtrains a ſling with a ſtone in it, while you whirl it round, and were its force ſtrong enough, would even break the ſling; this effort is called the centrifugal force; to this all revolving bodies are ſubject, and if they perform their revolution in the ſame time, it is proportioned to the greatneſs of the circle they deſcribe.

Now, ſince the earth revolves round its own axis in twenty-four hours, all the bodies or particles of matter which compoſe it will deſcribe circles; and conſequently each will, more or leſs, partake of this centrifugal force, in proportion to the circle it deſcribes.

ſcribes. And, becauſe the particles under the equator deſcribe the greateſt circle, therefore they will have the greateſt degree of centrifugal force; and the nearer the poles a particle is ſituated, the leſs will be its degree of centrifugal force; becauſe the circle it deſcribes will be ſmaller. The whole effect of this force tends to make bodies recede from the center of the circles they deſcribe, and a part of it is oppoſite to that of gravity, whoſe force everywhere impels bodies towards the center of the earth. This part of the centrifugal force continually increaſes the nearer you approach to the equator; becauſe under the circle, not only the centrifugal force is directly contrary to that of gravity, but alſo the circles deſcribed by the revolving bodies are there the greateſt. The great Sir Iſaac Newton and M. Huygins carried their calculations ſo far as to compare the quantity of the centrifugal force with gravity, and found that under the equator it was $= \frac{1}{289}$ part of gravity; that is, a body under the equator loſt the 289th part of its weight: then, conſidering that the waters of the ſea are in æquilibrio all over the earth, and ſuppoſing the earth to be formed of a homogeneous and fluid matter, or that had originally been ſo, they undertook to determine its figure by the laws of hydroſtatics.

That this fluid matter might be at reſt, and the waters continue equal on each ſide, the weight of a column of water, continued from the center to the equator, muſt of conſequence be equal to that of a column of water continued from the center to the pole; for otherwiſe they would not continue in æquilibrio; but, as the matter which formed the column continued from the center to the equator, was rendered lighter by the centrifugal force than that which compoſed the column which was continued from the center of the pole; it follows that the column at the equator muſt be longer than at the poles, and conſequently the earth is flattened at the poles.

This theory was greatly confirmed by the figure of the planet Jupiter; for as this planet is much greater than the earth, his diameter being 81155 miles, whereas the earth's is only 7964 miles; and as the revolution of this planet about its own axis is performed in 9 hours, 56 minutes, it follows, that the equatorial parts of his ſurface muſt have a prodigious velocity, which muſt conſequently cauſe him to be a ſpheroidical figure. Accordingly, the ingenious Mr. Pound diſcovered that the axis of the equator was to that of the poles, as 12 to 13.

Here the queſtion might have reſted, and had probably never been accurately ſolved, had it not been for the oppoſition it met with from M. Caſſini, though he afterwards ingenuouſly owned his miſtake. This gentleman, having meaſured the meridian of France from Dunkirk to Collioure, in Rouſſillon, declared, contrary to the opinion of all the mathematicians, that the earth, inſtead of being flattened, was lengthened towards the poles; that is, inſtead of being an oblate, it was a prolate ſpheroid, higher at the poles by about 95 miles. Sir Iſaac Newton remonſtrated, that, if this was the figure of the earth, bodies muſt be lighter, and a pendulum longer at the equator than in France, about half an inch; and that the diameter of the earth's ſhadow, from ſouth to north, muſt exceed its diameter from eaſt to weſt 2 min. 46 ſec. a twelfth part of the moon's diameter; all which was manifeſtly contrary to fact and obſervation: but even this, from ſo great a man, could not entirely remove all the ſcruples of ſome mathematicians, as they were ſupported by the obſervations and experiments of ſo diligent an artiſt as M. Caſſini.

At length the king of France, at an expence becoming a monarch who delighted in cultivating the ſciences, ſent two companies of mathematicians, the one to the equator, and the other to the arctic circle, in order to decide this affair, and accurately determine the true figure of the earth.

Were the earth a perfect ſphere, all the meridians would be circles; conſequently every degree of the meridian, like the degrees of a circle, would be equal; and every line, ſtanding at right angles, with (or upright upon) the meridian, would, if continued inwards, meet at the center. The French king's aſtronomers, by actually meaſuring a degree of the meridian, in the ſouth of France, and the ſame gentlemen meaſuring a degree of the meridian at the polar circle, found the latter exceeded the former by 86,8 Engliſh miles.

This being known, the difference of a degree at the pole from a degree at the equinoctial may be found, by examining *fig.* 11. where, let AB be the equatorial diameter, *P p* its polar diameter, RSTV a great circle in the ſphere of the fixed ſtars, and let R S be a degree on the meridian at the equinoctial, and TV a degree at the pole, and that all plumb lines are perpendicular to the plane of the horizon, then will the two plumb lines R *r* and S *s*, if continued, meet at *x*, and the ſpace or diſtance *r s* be the meaſure of one degree on the earth under the equinoctial: alſo, if the two plumb lines T *t* and V *v* be continued, they will not meet till they paſs the earth's center, and have their point of concourſe at O. And the diſtance of *v t* be the meaſure of a degree on the earth under the pole. But *r s* is the 360th part of a circle, whoſe ſemi-diameter is *r x*, the equitorial degree, and *t v* the polar degree, the 360th part of a circle, whoſe ſemi-diameter is the line *v o*. Therefore, the length of a degree of the meridian, under the equinoctial, has the ſame ratio to a degree under the pole, as the line *r x* has to the line *v o*, which was to be demonſtrated.

From whence may be drawn the following corollaries:

1. That if a hole was bored plumb down quite through the earth, it would not paſs through the

earth's center, except the place bored was under the pole, or under the equinoctial.

2. If a ſtone was to be dropped from the center of this hole, it would not fall directly down, but ſtrike againſt one ſide. And if it could find a paſſage according to its natural inclination, by the power of gravity, it would deſcribe a curve of the ſpiral kind, and would reſt at laſt at the earth's center; but if the diurnal and annual motion of the earth be taken into conſideration, the curve will be of another kind.

3. If an obſerver was at the earth's center, and the earth tranſparent, ſuch perſons as were travelling towards the poles would ſeem to him to lean forward, like men climbing the outſide of an hill, and thoſe travelling towards the equator, to lean backwards like thoſe going down an hill.

4. An obſerver upon a ſmall iſland, and under the equinoctial, having a free and open horizon, he would ſee farther, when he directed his ſight eaſt or weſt, than when it was directed north or ſouth; and that the ſpace contained within the limits of a man's view, is no where circular but juſt at the poles.

By obſervations made under the artic circle, by Meſſrs. de Maupertuis, Clairaut, Camus, Le Monier, the Abbé Outhier, and M. Celſius of Upſal; the length of a degree in whoſe middle the pole was elevated 66° 31′ was found to be 57437 toiſes (a toiſe is = 6,408 Engliſh feet): but by thoſe of Mr. Picard, as corrected by the ſaid gentleman, the length of one near Paris, where the mean latitude was 48° 50′ appears to be only 56925 toiſes, differing from the former by 512 toiſes. Now, to determine the earth's true dimenſions by the foregoing theorems applied to theſe obſervations, let S = Nat. ſine of 66° 33′ s = that of 48° 50′ D = 57437, d = 56925, and $E = e = 1$; then r = 3261600, $\frac{D-d}{d} = m =$, $009\frac{c}{b}\left(= 1 - \frac{m}{3\times SS - ss}\right)$ = .9892, b = 3272300, c = 3236500, and $b - c$ = 35800 toiſes; wherefore it appears, that the length of the earth's axis, from pole to pole, is 6473000 toiſes, or 7863,2 Engliſh miles; and that the difference between it and the equitorial diameter is about $\frac{1}{92}$ part of the former, or 86,8 miles.

Motion of the EARTH. The earth has a triple motion. 1. A diurnal motion round its own axis, from weſt to eaſt, in twenty-four hours, which occaſions the perpetual ſucceſſion of days and nights. It is agreeable to reaſon that the earth ſhould revolve about its axis to account for the appearance of ſuch a vaſt number of ſtars which ſeem to perform their revolutions round the earth in twenty-four hours; for the motion of theſe ſtars, were it real, would be incredibly ſwift and beyond all imagination, becauſe their diſtance, in reſpect of us, is almoſt infinite, and the orbit they have to run round ſo prodigiouſly great, that they muſt move at leaſt 100,000 miles in a minute.—2. An annual motion round the ſun in a year, which produces the different ſeaſons, and the lengthening and ſhortening of days. Let A, B, C, D, (*fig.* 12.) repreſent the orb of the earth, in which it revolves annually round the ſun E. A and C are the places of the earth at ſpring and autumn, B its place at ſummer, and D at winter. *a* is the north pole, *b* the ſouth, *c c* the polar circle, *d d l* the parallel of London, *e e* the tropick of Cancer, *f f* the equinoctial, *e g* the ecliptick, *g g* the tropick of Capricorn, *h h* the antartick circle. Now when the earth is at A, that is, in the vernal equinox, the ſun is vertical to the point *i* of the equinoctial *f f*, and from thence equally illuminates both the poles *a* and *b*, and all other places contained in circle *a c d e f g h b*, (which, for the future, I ſhall call the ſolar horizon, becauſe it divides the day from the night). Now as London moves round in the parallel *d k l* once in 24 hours, at ſun-riſe it will be at *d*, at noon at the point *k*, and at ſun-ſet at *d l*; but when the earth is at C, London will be at *d l* at ſun-riſe, at *d* at ſun-ſet, and at *k* at midnight. Likewiſe, you may obſerve, that juſt half the parallel is inlightened at once: therefore, our days and nights are at that time equal. Obſerve the like of any other place. When the earth is at B, it is ſummer with us, but winter with our Antipodes, then is the north pole *a*, and all the places within the polar circle *c c*, continually enlightened, without immerſing under the ſolar horizon *c h*, as you may ſee the ſouth pole *h b h*, at the ſame time, continually obſcured, without any day. Then London is at *d* at noon, on *k* at ſun-ſet, and at *d l* at midnight, where you may obſerve much greater part of the parallel *d k d l*, contained in the enlightened, than in the dark part of the earth, which is the reaſon of our day's being ſo much longer than our nights at that time of the year.

But when the earth is at D, it is our winter, then is the north pole *a c c*, involved in darkneſs, without any light (ſave that of the moon and ſtars), but at the ſouth pole *h b h*, they have continual day. Then is London at *d l* at noon, on *k* at ſun-riſe, and at *d* at midnight. You may alſo note, that there is juſt as much of the parallel *d k d l*, contained in the light part of the earth, as at B was contained in the dark part; by reaſon of which, our days, in winter, are juſt the ſame length as our nights are in ſummer.

By the third motion of the earth, we mean that motion by which the poles of the world revolve about the poles of the ecliptic, and occaſion what is commonly called the preceſſion of the equinoxes, or more properly, the retrogreſſion of the earth's nodes. See the article PRECESSION.

As to the velocity of the earth's motion, and the figure and time in which it performs a revolution round the ſun, ſee the articles PERIOD and ORBIT.

Quantity of Matter in the EARTH. This ar-

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duous problem can only be solved by the principles of gravitation. We know the force of gravity towards our earth, by the descent of heavy bodies, or by calculating how much the moon falls below the tangent of her orbit: also by computing, from their motions, how much a primary planet falls below its tangent in a given time, and how much any of Jupiter's and Saturn's satellites fall below their tangents in the same time, we are able to determine the proportion which the gravity of a primary planet to the sun, and of a satellite towards its primary, bears to the gravity of the moon towards the earth, in their respective distances. Then, from the general law of the variation of gravity, the forces that would act upon them at equal distances from the sun, Jupiter, Saturn, and the earth, are computed; which give the proportion of the quantities of matter contained in these different bodies; that is, if we suppose the matter of the sun to be 1, the quantities of matter in Jupiter, Saturn, and the earth, will be respectively $\frac{1}{1067}$, $\frac{1}{3021}$, $\frac{1}{169282}$.

The quantities of matter in these bodies being thus determined, and their bulk being known from astronomical observations, it is easy to compute their different densities. Thus, the densities of the sun, Jupiter, Saturn, and the earth, have been computed to be respectively as the numbers 100, $94\frac{1}{2}$, 67, and 400.

Theory of the EARTH. The earth in its natural and original state, Des Cartes, Burnet, Woodward, and Whiston, suppose to have been perfectly round, smooth, and equable; and they account for its present rude and irregular form principally from the great deluge. See the article DELUGE.

M. de Buffon, arguing from the spheroidical figure of the earth, and the laws of hydrostatics, supposes that the earth, as well as the other planets, are parts struck off from the body of the sun by the collision of comets, and consequently, when the earth assumed its form, it was in a state of liquefaction by fire. Of this, says he, we will be the more easily convinced, when we consider the nature of the matter contained in the body of the earth, the greatest part of which, as sand and clays, are vitrified, or vitrifiable substances; and, on the other hand, when we reflect upon the impossibilty of the earth's being ever in a state of fluidity produced by water, since there is infinitely more land than water; and besides, water has not the power of dissolving sand, stones, and other substances of which the earth is composed. How far the inequalities in the face of the earth, the beds of rivers, lakes, &c. and the various strata in its internal parts, serve to confirm this hypothesis, may be seen in Histoire Naturelle, &c. tom. 1. by M. de Buffon, and in the articles MOUNTAIN, RIVER, STRATA, &c.

Diameter of the EARTH. See DIAMETER.

Latitude of the EARTH. See LATITUDE.

Longitude of the EARTH. See LONGITUDE.

EARTH, in gardening and husbandry, if good, may be known by the sight, smell, and touch. First, by the sight. Earth that is of a bright chesnut or hazley colour, is accounted very good; of this colour are the best loams, and also the best natural earth; and this will be the better yet, if it cuts like butter, and does not stick obstinately, but is short, tolerably light, breaking into small clods, is sweat, will be tempered without crushing or chapping in dry weather, or turning to a mortar-like substance in wet. Next to this, the dark grey and russet earths are accounted the best: the light and dark ash-coloured are reckoned the worst; such as are usually found on common or heathy ground: the clear tawny is by no means to be approved; but that of a yellowish red colour is reckoned the worst of all; this is common in wild and waste parts of the country, and for the most part produce nothing but furze and fern, according as their bottoms are more or less of a light and sandy, or of a shingley gravel or clayey nature.—Secondly, by the smell. All earths that are good and wholesome will, after rain, or breaking with the plough or spade, emit a sweet smell.—Thirdly, by the touch. By this means we may discover whether it consists of substances entirely arenacious or clammy; that is, whether it be harsh, gritty, porous, or friable; or tender, fat, deterstive or slippery; that earth being always the best that is between the two extremes, and is neither too unctious or too lean, but such as will easily dissolve, and is of a just consistence between sand and clay; a loam or brick earth where cattle are accustomed to feed, requires little help or improvement but the plough or spade.——Barren earth is to be known divers ways; as, when instead of good green grass and a plentiful crop, it produces a thin, pale, small grass: also broom, furze, heath, moss, &c. denotes barren land, especially if they be small. Lands situated near the sea coast are often barren, being poisoned and starved by the vapours and storms proceeding from thence. On the contrary, good earth is known where it naturally produces mallows, docks, hemlock, and other weeds of the like nature; for such plants delight in fat deep earth; and it is ever to be observed, that such soil as produces weeds or grass luxuriantly, is undoubtedly rich and fruitful. For a further account of the different sorts of earths, see the articles CLAY, LOAM, SAND, &c.

EARTH, in chemistry, the fourth of the chemical elements, or principles, into which bodies are resolvable by fire.

EARTH-BANKS, in husbandry, &c. are a very common fence about London, and in several other parts of England. Where stones are not to be had cheap, these are to be preferred to all other fences, both for soundness and duration.

The best manner of making them is this: dig up some turf in a grassy place, a spit deep, or nearly

the breadth of the ſpade, and about four or five inches thick; lay theſe turfs, with the graſs outward, even by a line on one ſide, and on the backſide of theſe lay another row of turf, having a foot ſpace of ſolid ground on the outſide, to prevent the bank from ſlipping in, if it ſhould be any ways faulty. On the outſide of this make a ditch, or elſe let the ſides be lowered both ways with a ſlope two feet deep, and there will be no paſture loſt by the fence, becauſe it will bear graſs on both ſides.

The earth that is dug out of the ditches, or from the ſlope, muſt be thrown in between the two rows of turf, till the middle is made level with the reſt: then lay on two more rows of turf in the ſame manner; and with more of the earth fill up and make level as before. Let this method be continued till the bank is raiſed four feet high, or more, if neceſſary, only obſerving, that the higher it is to be carried, the wider the foundation muſt be made. As the bank is carried up, the ſides muſt not be raiſed perpendicular, but ſloping, inward both ways, ſo that at the top it may be about two feet and a half wide. This ſort of fence, when made with leſs care, and faced with clay, is left naked, and ſerves very well in ſome places; but, when it is thus managed with the turf, the joinings of the ſeveral pieces are hid in a little time, by the growth of the graſſy part of the turf on each ſide, and it makes a beautiful fence, of as green and pleaſant a colour as the reſt of the field.

EARTHING, in gardening, ſignifies covering the roots of plants with earth, as is practiſed with aſparagus, or banking againſt their ſides with earth, in order to blanch their leaves, as is done with cellery, &c. or drawing the earth up to the plants with a hoe, as is practiſed with peas, beans, cabbages, &c.

EARTHQUAKE, in natural hiſtory, a violent agitation, or trembling, of ſome conſiderable part of the earth, generally attended with a terrible noiſe like thunder, and ſometimes with an eruption of fire, water, winds, &c.

Earthquakes are allowed to be the greateſt and moſt terrible phænomena of nature, there being no ſecurity againſt their effects, when they come with the laſt degree of violence.

There are two ſorts of earthquakes; the one cauſed by the action of ſubterraneous fires and the exploſion of the volcanos, which are not felt but at ſmall diſtances, and at the times that the volcanos are agitated, or before they begin to open: and the other from air. When the materials that form ſubterraneous fires come to be fermented, heated, and inflamed, the fire makes efforts on all ſides; and if it does not naturally find an out-let, it raiſes the earth, and makes a paſſage for itſelf by throwing it off, by which means a volcano is produced, the effects of which are repeated, and they laſt in proportion to the quantity of inflammable matter it contains: if this matter be inconſiderable, there may happen a raiſing of the ground, a commotion, and an earthquake, without any volcano being formed by that means: the air, produced and rarefied by the ſubterraneous fire, may likewiſe find ſmall outlets by which it may eſcape; and in this caſe there will only happen an earthquake without any eruption or volcano. But when there is a large quantity of inflammable matter, and when it is locked up and confined by ſolid and compact ſubſtances, there happens a commotion and volcano too: but all theſe commotions cauſe no more than the firſt ſort of earthquakes, and can only ſhake a ſmall ſpace of ground. A very violent eruption, for inſtance, of Mount Ætna, will cauſe an earthquake over the whole iſland of Sicily; but it will never extend to three or four hundred leagues diſtance. When ſome new vents of fire have been formed in Mount Veſuvius, there are felt at the ſame time earthquakes at Naples, and in the neighbourhood of the volcano; but theſe concuſſions have never ſhaken the Alps, nor been communicated to France, or other countries remote from Veſuvius: in this manner earthquakes, produced by means of volcanos, are confined to a narrow ſpace; which is properly the effect of the re-action of the fire, and they ſhake the earth, juſt as the exploſion of a powder magazine cauſes a ſenſible concuſſion at ſeveral leagues diſtance.

But there is another ſort of earthquakes very different as to their effects, and, probably as to their cauſes; and theſe are ſuch as are felt at conſiderable diſtances, and which ſhake a long tract or ſlip of ground, without any volcano or eruption appearing. We have inſtances of earthquakes that are felt at the ſame time in England, France, Germany, and even in Hungary; and theſe always extend a great deal more in length than in breadth; they ſhake a tract of ground with more or leſs violence in different places; and they are almoſt always accompanied with a dull noiſe, much like that of a large carriage that rolls along ſwiftly.

In order to underſtand thoroughly what may be the cauſes of this kind of earthquake, we muſt remember that all inflammable matters capable of exploſion, ſuch as gun-powder, generate a large quantity of air; that this air, produced by the fire, is in a ſtate of very great rarefaction; and that by means of this compreſſion, in which it finds itſelf in the bowels of the earth, it muſt produce very violent effects. Let us, therefore, ſuppoſe, that at a very conſiderable depth, as a hundred or two hundred fathoms, there be found pyrites and other ſulphureous ſubſtances, and that by the fermentation produced by the filtering of the waters, or other cauſes, theſe happen to take fire, let us ſee what will be the reſult; in the firſt place, theſe ſubſtances are not regularly diſpoſed in horizontal ſtrata; on the contrary, they are contained in the perpendicular fiſſures, in the

caverns

caverns at the foot of these fissures, and in other places where the water can act, and into which they can penetrate: these substances, coming to take fire, will generate a large quantity of air, whose spring being compressed in a little room, as in that of a cavern, will not only shake the superior ground, but seek for passages to escape by, and to extricate itself. The passages that present themselves, are the caverns and canals formed by the subterraneous waters and rivulets: the rarefied air will violently precipitate into all the passages that are open, and form a furious wind in these subterraneous cavities, the noise of which shall be heard at the surface of the earth, accompanied with concussions thereof; this subterraneous wind produced by the fire, will extend as far as these cavities, and cause an earthquake more or less violent, in proportion as it is remote from the fire, and finds passages more or less narrow: this motion being performed lengthwise, the concussion will be in the same direction, and the earthquake felt in a long zone or tract of ground. This air will cause no eruption or volcano, because it will find sufficient room to dilate itself, or, rather, because it will find outlets, and issue out in form of wind or vapour: and even should it be denied that there are actually any subterraneous passages, by which this air and these vapours may escape, we may easily conceive, that in the very place where the first explosion happens, the ground being raised up to a considerable height, the adjoining place must be divided and rent asunder horizontally, in order to correspond with the primary motion, which is sufficient to make passages that may communicate the motion to a very great distance. This explication agrees with all the phænomena. An earthquake is not felt in the very same instant in two distant places; for instance, a hundred or two hundred leagues: there is no external eruption of fire caused by these earthquakes that reach to some distance; and the noise that accompanies them, almost always points out the progressive motion of the subterraneous fire.

What has been said may be farther confirmed by connecting it with other facts. It is well known, that mines exhale vapours independently of the winds produced by the current of the waters, and that there are often observed in them currents of unwholsome air and suffocating exhalations; and besides, there are holes, abysses, and deep lakes on the earth, that produce winds, as the lake of Boleslaw, in Bohemia.

Earthquakes, it is true, are a great deal more frequent in places where volcanos are than elsewhere; as in Sicily and Naples, and it is well known from observations made at different times, that the most violent earthquakes happen at the time of the greatest eruptions of volcanos. *Buffon's Histoire Naturelle.*

Earthquakes may be produced artificially, by mixing equal quantities of sulphur and the filings of iron, and beating them together, with an addition of water, into a kind of paste; and burying the whole three or four feet under the surface of the earth; and in seven or eight hours time the earth will begin to tremble, crack, and smoke, and burst out into flames.

EASEL-Pieces, a denomination given by painters to such pieces as are contained in frames, in contradistinction from those painted on cielings, &c.

EASEMENT, in law, a privilege or convenience which one neighbour has of another, whether by charter or prescription, without profit; such are passages through his lands, a sink, or the like. These, in many cases, may be claimed.

EAST, one of the four cardinal points of the world; being that point of the horizon where the sun is seen to rise when in the equinoctial. See Compass, Horizon, Equinoctial, &c.

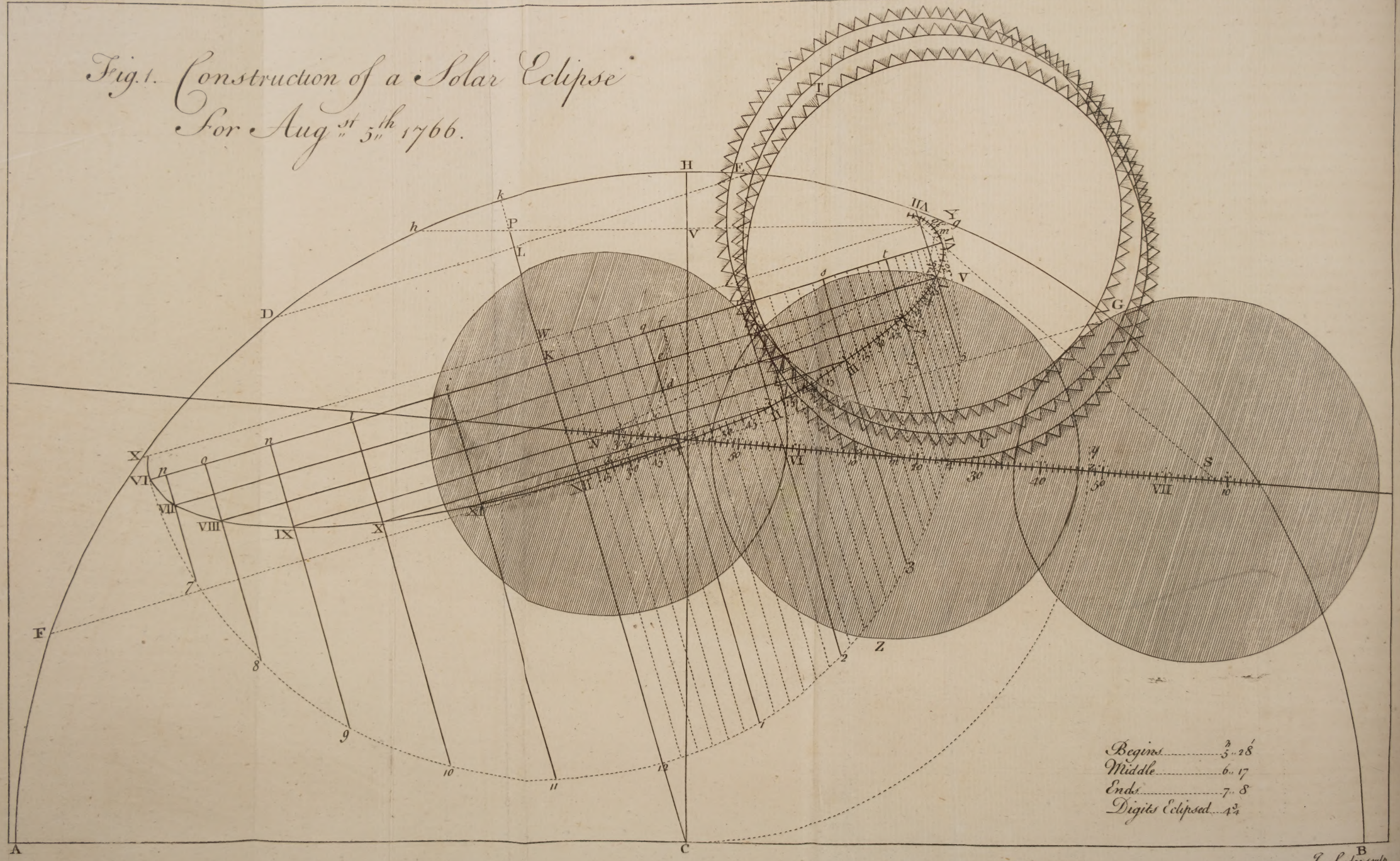
EASTER is the great festival of the anniversary commemoration of our Saviour's resurrection; which, for its antiquity and excellence, challenges the precedence of all others.

The Greeks and Latins call it *pascha*, originally an Hebrew word, signifying a passage, applied to the feast of the passover, held by the Jews much about the same time. In English it is called Easter, from a goddess of that name, worshipped by the Saxons in the month of April.

It was in conformity to the custom of the Jews, who were commanded by God himself to celebrate the passover in the first month, and on the fourteenth day of that month, in the even, that the primitive fathers ordered that the fourteenth day of the moon from the calendar new moon, which immediately follows after the twenty-first of March, at which time the vernal equinox happened upon that day, should be deemed the Paschal full-moon, and that the Sunday after, because our Saviour rose on the day after the Jewish passover, should be Easter-day; and it is upon this account that our Rubric has appointed it upon the first Sunday after the first full moon immediately following the twenty-first day of March, upon which day, at that time, the vernal equinox happened: whence it appears, that the true time of celebrating Easter, according to the original institution of the feast of the passover, as well as according to the intent of the council of Nice, was to be the first Sunday after the first full-moon immediately following the vernal equinox, or when the sun entered into the first point of Aries: and this was the principal view pope Gregory had, when he reformed the calendar, to celebrate Easter according to the intent of the Nicene council: and as the new-style has been ordered by act of parliament to be used in Great-Britain for the future, it will be necessary to shew the method

of

Fig. 1. Construction of a Solar Eclipse For Aug.st 5.th 1766.



J. Lodge sculp.

ECLECTICS, *Eclectici*, ancient philoſophers, who, without attaching themſelves to any particular ſect, ſelected whatever appeared to them the beſt and moſt rational.

Potamon of Alexandria was the firſt of the eclectics: he lived in the reigns of Auguſtus and Tiberius; and being tired with the ſcepticiſm of the Pyrrhonians, he reſolved upon a ſcheme that would allow him to believe ſomething, but without being ſo implicit as to ſwallow any entire hypotheſis.

ECLECTOS, the ſame with what is more uſually called linctus. See LINCTUS.

ECLIPSE, in aſtronomy, a privation of the light of ſome luminary, by the interpoſition of an opaque body, either between it and the ſpectator's eye, or between it and the ſun.

Should we enquire into the meaning of the word eclipſe, it will be found a derivative of the Greek verb ἐκλείπω, to faint or ſwoon away; for the Grecians ſay, that ſuch perſons as are troubled with a death-like fainting or ſwooning, are eclipſed, or do fall into an eclipſe. Thus, alſo, the moon's body ſeems to vaniſh and grow dark, when deprived of the light of the ſun, by the interpoſition of the earth. But we cannot apply this term ſo properly to the ſun; becauſe the ſun receives its light from no other body; it alone is the great fountain of light and heat; therefore, we may more properly, and ought to ſay, that this phænomenon is an eclipſe of the earth; becauſe it is the earth that is deprived of the light of the ſun by the interpoſition of the moon.

Eclipſes of the luminaries are either ſolar or lunar. The ſolar is cauſed by the interpoſition of the moon, between the ſun and the earth; by which means, ſome particular part of the earth is deprived of the ſun's light for a certain ſpace of time; though other places, at the ſame time, enjoy the full light of that great luminary. But the lunar eclipſe is always univerſal, and appears in all places of the ſame quantity and duration; which is accounted for in this manner: the moon is an opacous body, and has no light but what ſhe receives from the ſun; and therefore cannot be eclipſed, or loſe the light of the ſun, but when ſhe is in her full; when, it is known, ſhe has little or no latitude, and moves diametrically oppoſite to the ſun, and the earth interpoſing itſelf in a direct line, between them, caſts its ſhadow upon the moon, and thereby deprives her of the ſun's light, which may be more or leſs, according to the latitude of the moon.

In ſolar eclipſes it is to be obſerved, that they always begin on the weſt ſide, and end on the eaſt; becauſe the moon, by her proper motion in longitude, from weſt to eaſt, firſt enters upon the weſt limb of the ſun. On the contrary, the lunar eclipſes always begin on the eaſt and end on the weſt ſide; for her motion being from weſt to eaſt, the eaſt part of her body muſt neceſſarily firſt enter the earth's ſhadow.

The ſun is very ſeldom, but the moon is often, totally eclipſed. And the eclipſe of the moon appears from all parts alike, as to quantity and duration; and a reduction for the difference of the meridians, will ſhew the beginning, middle, and end of any ſuch lunar eclipſe for any determinate place on the earth: but this cannot be done in the eclipſe of the ſun; becauſe, at the ſame moment of time, it is leſs in one place than in another; in one part of the earth total, when in another part of the globe they have no eclipſe at all, which is cauſed by the moon's vicinity to the earth, and ſudden changes of her parallax in longitude and latitude, and the ſmall proportion the moon bears to the ſun and earth. To demonſtrate which, let A (*plate* XLIII. *fig.* 2.) repreſent the ſun and center of the world, and let BKRB repreſent the annual orb of the earth, R the body of the earth, SZVS ſhew the orb of the moon; O is the place of the moon, when ſhe is in conjunction with the ſun; VX or Z ſhew the place of the moon when ſhe is in oppoſition; D is the conical point of the earth's ſhadow, which is greater or leſs, according to the diſtance of the earth from the ſun.

By which figure it appears, that the whole body, or the ſun, by the interpoſition of the moon at O, is hidden from the ſight of him that ſtands in the point between R and P: whereas only half the ſun is obſcured to him that ſtands at R; and there is no part of it hidden from him that ſtands at M.

This, I apprehend, may ſuffice to demonſtrate the cauſe of eclipſes of the ſun in particular;

The moon being leſs than the earth, her ſhadow can never cover the whole globe, only a part of it, ſuch as IH; and a total darkneſs happens only to thoſe inhabitants on whom the ſhadow falls. The circumjacent places will be illuminated with ſome of the ſun's beams, called the penumbra, or a lucid partial ſhadow; which will have different degrees of illumination, according to the diſtance from the center of the real ſhadow. The inhabitants where this penumbra falls, will only ſee a part of the ſun's diſk obſcure, which will appear to be more or leſs, in proportion as they are ſituated nearer or farther remote from the center: without this penumbra, all the ſun's body will be ſeen at the ſame time, and no eclipſe perceived at all.

Let S (*fig.* 3.) repreſent the ſun in the equinoctial, and E the earth; then will A be the moon conjoined with the ſun to the ſouth pole, B a true conjunction at the earth's center, or in the equator, and C the moon conjoined with the ſun at the north pole.

Now it is manifeſt, when the moon is at B, her ſhadow falls in the torrid zone; and conſequently muſt take away the ſun's light from that part of the globe; when at the ſame time to the north and ſouth poles only part of the ſun's body will be darkened: and when the moon is centrally conjoined

at

at C, the sun may be totally eclipsed at the north pole, when at the same time to the south part of the world he is free from the least obscuration. Hence the penumbral cone is determined in this manner:

Let A (*fig.* 4.) represent the sun, E the moon, D the earth, C the moon's opaque shadow, and AED a right line joining the three centers; draw the line FG, from the superior limb of the sun to the earth's surface, touching the inferior limb of the moon; and the line H I from the inferior limb of the sun, touching the superior limb of the moon; and they will intersect each other in the point K; which point will be the vertex, and the line KN the axis of the penumbral cone: about which, if the line KG or KI be made to revolve, it will describe the limits of the penumbra upon the earth's surface, and is here represented by the faint shadow LM.

To know how much of the earth's surface can be involved in this penumbra, first, let us suppose the angle of the cone, as demonstrated by Dr. Keill, in his Astronomical Lectures, page 116, without sensible error, equal to the apparent diameter of the sun; then in the triangle KOE, right-angled at O, is given the semi-diameter of the moon OE, and the semi-angle of the cone OKE, to find the distance of the moon's center from the vertex K; which when known, added to the moon's distance from the earth, will give the whole height of the said cone from the earth's center: then in the oblique triangle DKI, are given the sides DK and DI, together with the angle DKI; hence will be found the angle NDI, whose measure is the arch IN, the semi-diameter of the penumbra upon the earth.

After the same manner may be found the quantity of the earth involved in the real shadow. But if the apparent diameter of the sun exceed that of the moon, the real shadow will not reach the earth: in this case there may be a central eclipse of the sun, but not a total one: this is called an annular eclipse; the moon's body appears in the sun's disk, surrounded by a bright luminous circle. Such an one was observed by Clavius at Rome, April 9, 1567; and such another passed over the city of Edinburgh, on February 18, 1736-7, in the evening.

As it is evident there can be no eclipse of the sun, but when the moon is in the change; for then only the moon is in opposition to the sun, and near the earth's shadow: so there can be no eclipse of the moon but at the time of the full. And since there is a new and a full moon every month, it will be proper to give a reason, why there is not also an eclipse at those times every month. If the moon's orbit lay in the plane of the earth's orbit, that is, if these two planes were to coincide in a plane passing through the sun, there would be a total eclipse of the moon at every full, and consequently a central eclipse of the sun at every change. This is improperly attributed to the sun, because it is really an eclipse of the earth; for all the time the sun retains his own light without the least diminution, and only those inhabitants of the earth that are under the shadow of the moon, or of the penumbra, are truly eclipsed.

But the orbs of the earth and moon, being placed obliquely, and not both in the same plane, intersect each other in two points, called nodes, where the moon's orbit is found to be inclined to the ecliptic in an angle of about five degrees; therefore the moon may be in such a position from the nodes, as to pass the opposition or conjunction, either too high or too low to fall into the earth's shadow, or to have her shadow or penumbra fall upon the earth. Hence it is very possible every full and new moon may not be eclipsed. And it will farther appear, that no eclipse can happen but when the moon is near one of her nodes; consequently the quantity of the eclipse depends upon the distance from it: and of both kinds it may be either total, partial, or central.

Let E (*fig.* 5.) represent the earth, S, S, S, three different positions of the sun, and M, M, M, M, M, M, various places of the moon in her orbit; let us now suppose a conjunction or an opposition to be made at B or C, at both which places the moon happens to be exactly in the nodes; consequently, in either of them there will be a central eclipse. Again, let us imagine the true syzigy at D or E; in both those points the moon has considerable latitude, and can only produce a partial eclipse. Farther, if the moon be removed to G or H, there will be no eclipse at all. Thus, in any part of the moon's orbit, by knowing the moon's distance from either node, the limits of eclipses, both solar and lunar, may be easily determined; that of the sun will be found nearly 18°, and that of the moon 12°. Hence it is that eclipses of the sun, in general, are more frequent than those of the moon; although in any particular place they are much fewer.

Now from the horizontal parallaxes of the sun and moon, and their apparent semi-diameters, the possibility of a solar eclipse is thus determined:

Let A (*fig.* 6.) represent the sun, B the earth, and C the moon; then the angle HEG will be the apparent diameter of the sun, seen from the earth's center; and QER the apparent diameter of the moon, seen from the same place; and consequently her shadow: hence, LKM will be the penumbral cone, limiting the utmost extent of such an eclipse, and W Z the quantity of the earth's surface involved in the real shadow at the same time. Now to find the apparent diameter of the penumbra in the moon's orbit, we have given the points L and M, upon the earth's superficies; in which, when the moon is at C, the circles XQ and RT will represent the sun's apparent disk free from obscuration.

To

To the inhabitants at L the moon's north limb will just touch the sun's south one, and may here represent the beginning of an eclipse; when, at the same time, to the people at M the moon's upper limb will just go off the sun's lower limb, representing to them the end of an eclipse.

Thus it appears, that the distance of the two centers, S and Y, is equal to the apparent diameter of the penumbra; wherefore upon F, with the sum of the semi-diameters of the sun and moon, equal to the angle F M Y, describe the circle S Y P, and it will represent the penumbra in the moon's orb.

It is to be observed, if in the above figure C represents the moon perpendicular to the equator, and N the north pole, M will be the north limit, and L the south limit of the said eclipse. Again, to find the apparent diameter of the earth's disk in the moon's orb, you have given the horizontal parallax of the sun N D E, and E F N, the horizontal parallax of the moon; draw the line I O parallel to D K E, then will the angles E D N and D N I be equal. Therefore out of the angle F N O, equal to the moon's horizontal parallax, take the angle T N O, that of the sun, and there will remain the angle E N T equal to the apparent semi-diameter of the earth's disk in the moon's orb. Hence upon the center F, with the difference of the horizontal parallaxes of the sun and moon E N T, describe X V T, and it will represent the same.

Now, as was said before, if none of this penumbra fall within the said disk, there can be no eclipse: for let E (*fig.* 7.) be the disk in the ecliptic, and F the penumbra in the moon's orbit, F ☊ is the distance of the luminaries from the node: here it is plain that the moon's latitude is greater than the sum of the semi-diameters of the disk and penumbra, and therefore no eclipse can happen to that part of the moon's orbit: but if the sum of the semi-diameters of the disk and penumbra be greater than the moon's true latitude, as at C, than an eclipse must unavoidably happen to some place: and if the moon's latitude be less than the semi-diameter of the disk, as at B, the eclipse will be central, and somewhere may be total. And further, if all the penumbra fall within the disk, as at A (*fig.* 7.) the same for some time may be general. It is to be noted, that in partial eclipses the center of the penumbra falls without the disk.

We shall next give the method of constructing solar eclipses geometrically: but before we can do this, we must have the following elements calculated from astronomical tables; and as examples are found to convey any thing of this intricate nature in a more familiar manner than precepts alone, we shall give a construction of the solar eclipse, which will happen the 5th day of August next (1766), from tables which have undergone the strictest examination, and have very seldom been known to err a minute from the truth.

1. True time of the ecliptic conjunction, Aug. 1766, apparent time	5d	5h 42′	12″
2. True place of the ☉ and ☽ at that time ☌	13°	9′	52″
3. Moon's lat. north	0°	32′	36″
4. Moon's horizontal parallax	0°	53′	55″
5. Sun's declination	16°	53′	17″
6. Sun's true horary motion		2′	24″
7. Moon's ditto		29′	25″
8. Sun's semi-diameter		15′	47″,5
9. Moon's ditto		14′	42″,5
10. Angle of the moon's visible way	5°	14′	48″
11. Sun's horizontal parallax	0°	0′	9″
12. Lat. of Greenwich	51	28′	39″

1. Take the sun's parallax from the moon's, gives 53′ 46″, which take from a scale of equal parts, so large as to give $\frac{1}{8}$ of an inch at least to every minute of parallax, and with this extent, as a radius, describe the semi-circle A E B (plate 44, *fig.* 1.) from the center S; which semi-circle shall represent the northern half of the sun's enlightened disk.

2. Upon the center C raise the straight line CH, perpendicular to the diameter ACB; so ACB shall be a part of the ecliptic, and CH its axis.

3. Being provided with a good sector, open it to the radius CA in the line of chords; and taking from thence the chord of $23\frac{1}{2}$ degrees in your compasses, set it off both ways from H, to *g* and to *h*, in the periphery of the semi-disk; and draw the straight line *g* V *h*, in which the north pole of the disk will be always found.

4. When the sun is in Aries, Taurus, Gemini, Cancer, Leo, and Virgo, the north pole of the earth is enlightened by the sun: but whilst the sun is in the other six signs, the south pole is enlightened, and the north pole is in the dark.

5. And when the sun is in Capricorn, Aquarius, Pisces, Aries, Taurus, and Gemini, the northern half of the earth's axis C XII P lies to the right hand of the axis of the ecliptic, as seen from the sun; and to the left hand, whilst the sun is in the other six signs, as in this example.

6. Open the sector, till the radius (or distance of the two 90's) of the lines be equal to the length of V *h*, and take the line of the sun's distance from the solstice (43° 9′ 52″) as nearly as you can guess, in your compasses, from the line of lines, and set off that distance of V to P in the line *g* V *h*, because the earth's axis lies to the left hand of the axis of the ecliptic in this case, the sun being in Leo; and draw the straight line C XII P for the earth's axis, of which P is the north pole. If the earth's axis had lain to the right hand from the axis of the ecliptic, the distance VP would have been set off from V towards *h*.

7. To draw the parallel of latitude of any given

place, as suppose Greenwich, or the path of that place on the earth's enlightened disk as seen from the sun, from sun-rise till sun-set, take the following method:

Subtract the latitude of Greenwich, 51°½ from 90°, and the remainder 38°½ will be the co-latitude, which take in your compasses from the line of chords, making CA or CB the radius, and set it from *b* (where the earth's axis meets the periphery of the disk) to X and Y, and draw the occult or dotted line XWY. Then, from the points where this line meets the earth's disk, set off the chord of the sun's declination 16° 5′ 3″ to D and F, and to E and G, and connect these points by the two occult lines F XII G and DLE.

Bisect LK XII in K, and through the point K draw the black line VI K VI; then making CB the radius of a line of sines on the sector, take the co-latitude of 38°½ from the sines in your compasses, and set it both ways from K to VI and VI. These hours will be just in the edge of the disk at the equinoxes, but at no other time in the whole year.

With the extent K VI taken in your compasses, set one foot in K (in the black line below the occult one) as a center, and with the other foot describe the semi-circle VI 7 8 9 10, &c. and divide it into 12 equal parts; then from these points of division, draw the occult lines 7 *p*, 8 *o*, 9 *n*, &c. parallel to the earth's axis C XII P.

With the small extent K XII as a radius, describe the quadrantal arc XII *f*, and divide it into six equal parts, as XII *a*, *ab*, *bc*, *cd*, *de*, and *ef*; and through the division-points *a*, *b*, *c*, *d*, *e*, draw the lines VII *e* V, VIII *d* IV, IX *c* III, X *b* II, and XI *a* I, all parallel to VI K VI, and meeting the former lines 7 *p*, 8 *o*, &c. in the points VII VIII IX X XI, V IV III II and I; which points shall mark the several situations of Greenwich on the earth's disk, at these hours respectively, as seen from the sun; and the elliptic curve VI VII VIII, &c. being drawn through these points, shall represent the parallel of latitude, or path of Greenwich, on the disk, as seen from the sun, from its rising to its setting.

N.B. If the sun's declination had been south, the diurnal path of Greenwich would have been on the upper side of the line VI K VI, and would have touched the line DLE in L. It is requisite to divide the horary spaces into quarters, and, if possible, into minutes also.

8. Take the moon's latitude (32′ 36″) from the same scale the semi-diameter of the earth's disc (C A) was taken from, and lay it down on the line C H from C to *x*.

9. With the radius C *x* on *x*, as a center, describe the arc C *y*, and making that extent a radius on the line of chords, take therefrom the chord of the complements to the moon's visible way = 84° 45′ 12″, and set it off from C to *z*, then through the points *x* and *z* draw the indefinite right line N S, which will be the path of the penumbra's center over the earth's disc, the point *x* being the nearest approach of the center of the penumbra to the disc, and is therefore the ecliptic conjunction of the sun and moon.

Note. The moon's latitude is now north descending; had it been north ascending, the arc C *y* must have been described from C towards the left-hand, and the complement to the angle of the moon's visible way set off in the same manner. It must also be remarked, that the inclination of the penumbra's path, with respect to the ecliptic A B, will be the same as now, had the moon's latitude been south descending, and the contrary way when south ascending.

10. Take the moon's true horary motion from the sun, 27′ 1″, in your compasses, from the scale CA (every division of which is a minute of a degree) and with that extent make marks along the path of the penumbra's center, and divide each space, from mark to mark, into 60 equal parts or horary minutes, by dots; and set the hours to every 60th minute in such a manner, that the dot signifying the instant of new moon by the tables, may fall into the point *x*, half way between the axis of the moon's orbit, and the axis of the ecliptic; and then, the rest of the dots will shew the points on the earth's disc, where the penumbra's center is at the instants denoted by them, in its transit over the earth.

11. Direct the points of your compasses to the same moments of time in the path of Greenwich and in the path of the penumbra, and try them backwards and forwards until you find those which are nearest to each other, which will be found at 6ʰ 17′; this time must evidently be the middle of the eclipse, or greatest obscuration.

12. Take the sun's semi-diameter, 15′ 47″, in your compasses, from the same scale from which you laid down C A, (the semi-diameter of the disc) and setting one foot in the path of Greenwich at *m*, namely, at 17 minutes past VI, with the other foot describe the circle U T, which shall represent the sun's disc as seen from Greenwich at the middle of the eclipse. — Then take the moon's semi-diameter, 14′ 42″, in your compasses from the same scale; and setting one foot in the path of the penumbra's center, at 17 minutes after VI, with the other foot describe the circle V Z for the moon's disc, as seen from Greenwich, at the middle of the eclipse, or time of greatest obscuration; and the portion of the sun's disc which is hid or cut off by the moon's, will shew the quantity of the eclipse at that time; which quantity may be measured on a line equal to the sun's diameter, and divided into twelve equal parts for digits, and here will be found = 4¾ digits nearly.

13. Lastly, take the semi-diameter of the penumbra, 30′ 30″ from the scale within C A in your compasses; and setting one foot in the line of the pe-

penumbra's central path, direct the other foot toward the path of Greenwich, and carry that extent backwards and forwards, till both the points of the compasses fall into the same instants in both the paths: and these instants will denote the time when the eclipse begins at Greenwich.—The like method will shew at what time the eclipse ends at Greenwich, which will be found at 8 minutes past VII.

In this construction it is supposed, that the angle under which the moon's disc is seen, during the whole time of this eclipse, continues invariably the same; and that the moon's motion is uniform and rectilineal during that time.—But these suppositions do not exactly agree with the truth; and therefore, supposing the elements given by the tables to be accurate, yet the times and phases of the eclipse, deduced from its construction, will not answer exactly to what passeth in the heavens; but may be two or three minutes wrong, though done with the greatest care.—Moreover, the paths of all places of considerable latitudes are nearer the center of the earth's disc, as seen from the sun, than these constructions make them; because the disc is projected as if the earth were a perfect sphere, although it is known to be a spheroid. Consequently, the moon's shadow will go farther northward in all places of northern latitude, and farther southward in all places of southern latitude, than it is shewn to do in these projections.

We shall now give a method of computing solar or stellar eclipses without parallax.

Let the requisites for the eclipse be found and projected as before directed; but it is not necessary to project with great accuracy.

Then first (in Plate XLV. *fig.* 1.) we hall have SC = SM × fine of lat. of the place, × by the cosine of the sun's declination, ÷ by the square of radius; where SM is equal the semi-diameter of the disk, and SC equal the distance of the transverse axis of the ellipse from the center of the projection.

Again, we shall have CN equal to SM × by cosine of the latitude × fine of sun's declination ÷ by the square of radius where CN is equal the semi-conjugate diameter of the ellipse; and we have CX equal to SM × cosine of the lat. and divided by radius; where CX is equal to the semi-transverse axis of the ellipse.

Let it be required to find the distance of the sun and moon's centers at a given time, before the center of the moon passes the point P, suppose B the place of the moon's center at the given time, and H the place of the vertex or observer at the same time. Then let fall HE perpendicular to the transvers axis of the ellipse, (described by the vertex) and HA perpendicular to the conjugate. Then will CE = HA be the fine of the hour from noon to the radius of the semi-transverse axis of the ellipse; and HE = CA will be the cosine of the same hour, to the radius of the semi-conjugate axis; wherefore SC and CA being found, SA will be known, and in the right-angled triangle SAH, the two sides SA and HA being given, the angle ASH, and the side SH may be found.

Also the angles ESL and MSE being given by the previous calculation, the angle PSH will be given. And in the right-angled triangle PSB, the side SP equal the nearest approach of the centers, which will be given by the calculation; and the side PB, which is the time from B, the place of the moon's center to its passage over the point P, turned into motion by the horary motion of the moon from the sun, from whence the angle PSB, and the side SB will be found. Then the angles PSH and PSB being known, the angle HSB will be also known: and in the triangle HSB, the sides SH and SB, with the angle HSB between them being given (by the theorem commonly used in the calculation of the geocentric places of the planets) we may find the other two angles, and the side HB = the distance of the centers of the sun and moon at the given time. And if the distance thus found, be equal to the semi-diameter of the penumbra, equal the sum of the semi-diameters of the sun and moon, then that time is the beginning of the eclipse. But if it be either greater or less, we must proportion a time by the horary motion of the moon from the sun to be added to, or subtracted from it; and if we repeat the calculation for the time thus found, the beginning and the end of the eclipse may be found to great accuracy.

The angle ZH*d* = the supplement of the angle BHS before found, is equal to the number of degrees from the zenith point of the sun to the point of the limb that is first touched by the moon's limb. The difference of declination of the point *d* where the moon's limb first touches the sun's limb from the center, or limb of the sun will be known; for let the pricked line *df* be the parallel of declination on the sun's limb, then the angle ZH*d*, just before found, added to the angle ZHU = the angle HSA, found by the foregoing calculation, will be = the angle *d*HU the cosine, of which to the radius of HU = the sun's semi-diameter is equal to H*f*, the declination from the center. And the versed sine of the same angle to the same radius, is equal to EU the declination of the point *d* from the sun's limb. The same may be found at the end or any other phasis of the eclipse.

When the line *k b*, perpendicular to the line of the moon's way, cuts the same time in the path of the vertex, and in the moon's way, then is the middle of the eclipse or greatest obscuration at that time; and if the angles of the triangle *b*S*b* be found as before directed, then *bb* at the middle of the eclipse will be a minimum, or the two angles S*b*P and S*b*H will be equal to a right angle, *s o* will be equal to the semi-diameter of the penumbra — *b b*. And the lucid part *o y* will be equal the difference of the

the semi-diameter of the sun and moon + *b b*. And the angle which the pricked line connecting the cups forms with Z S the vertical line of the sun's diameter, is equal to the angle B H S — a right angle.

Of the general transit of an eclipse, &c. and how to find the time and particular place of the beginning, &c. of the general eclipse.

Let B R C N (*fig.* 2.) represent the earth's disk in the ecliptic, B C and F K, &c. the moon's way or passage of the penumbra over it, P the north pole. Now the time when the moon's center will be at F D I H M E and R is required. In the first place, here is given F O = K O, the sum of the semi-diameters of the disk and penumbra; secondly, D O = O E, the semi-diameter of the disk; and lastly, M O, the nearest approach of the luminaries to the center of the disk, to find F O H and D O H, the two angles of incidence. By the solution of a right angled triangle, having found the reduction M H, say, As O P or D O is to the radius, so is H O to the sine complement of the angle H O F or D O H: then to find the semi-duration F H or H K, the analogy is, As the radius is to F O; so is the angle of incidence F O H to F H: or by Euc. i. 47. $F H = \sqrt{F O^2 - H O^2}$. In like manner may be found D H = H E; which, if divided by the hourly motion of the moon from the sun, will give each respective arch in time; this added to, or subtracted from, the time of the greatest obscuration, will give the beginning and ending of the general eclipse, &c.

Now, to find the latitude and longitude of those places upon the earth, over which the center of the penumbra passes, O will be that place to which the sun is vertical; its latitude is always equal to the sun's declination; and its longitude, from the place to which the tables are accommodated, is equal to the time from noon in that place reduced into degrees and minutes: hence the position of the center is known; and consequently, by the doctrine of spherics, the latitude and longitude of any given point, such as G, D, I, H, M, E, or L, may be found. G is the place where the shadow first touched the earth; D the place where the center first comes on, I the point where the sun is eclipsed in the universal meridian; H the place where the center falls; M the nonagesimal degree; E the place where the center goes off from the earth; L the place where the penumbra leaves it.

The mean velocity of the shadow over the earth is always equal to the hourly motion of the moon from the sun in the moon's orbit, reduced into geographical miles.

Lunar ECLIPSES. The beginning, end, and middle of a lunar eclipse is found much the same as has been shewn of the sun's eclipse. However, having collected the previous elements, as mentioned before in the solar eclipse, take the following example of constructing a lunar eclipse.

1. Draw the right line A C B (*fig.* 3.) for part of the ecliptic, and C D perpendicular thereto for the southern part of its axis; supposing the moon to have south latitude.

2. Add the semi-diameters of the moon and earth's shadow together, and take this from the scale in your compasses; and setting one foot in the intersection C as a center, with the other foot describe the semi-circle A D B, in one point of which the moon's center will be at the beginning of the eclipse, and in another at the end thereof.

3. Take the semi-diameter of the earth's shadow in your compasses from the scale, and setting one foot in the center C, with the other foot describe the semi-circle K L M for the southern half of the earth's shadow, because the moon's latitude is south in this eclipse.

4. Make C D equal to the radius of the line of chords on the sector, and set off the angle of the moon's visible path with the ecliptic from D to E, and draw the right line C F E for the southern half of the axis of the moon's orbit, lying to the right hand from the axis of the ecliptic C D, because the moon's latitude is south descending.—It would have been the same way (on the other side of the ecliptic) if her latitude had been north descending; but contrary in both cases, if her latitude had been either north ascending or south ascending.

5. Bisect the angle D C E by the right line C *g*; in which line, the true equal time of opposition of the sun and moon falls, as given by the tables.

6. Take the moon's latitude from the scale with your compasses, and set it from C to G, in the line C G *g*; and through the point G, at right angles to C E F; draw the right line P G N for the path of the moon's center.——Then, F shall be the point in the earth's shadow, where the moon's center is at the middle of the eclipse; G, the point where her center is at the tabular time of her being full; and H, the point where her center is at the instant of her ecliptical opposition.

7. Take the moon's horary motion from the sun in your compasses from the scale; and with that extent make marks along the line of the moon's path P G N: then divide each space from mark to mark, into 60 equal parts, or horary minutes, and set the hours to the proper dots in such a manner, that the dot signifying the instant of full moon may be in the point G, where the line of the moon's path cuts the line that bisects the angle D C E.

8. Take the moon's semi-diameter in your compasses from the scale, and with that extent as a radius, upon the points N, F, and P, as centers, describe the circle Q for the moon at the beginning of the eclipse, when she touches the earth's shadow at V; the circle R for the moon at the middle of the

the eclipſe; and the circle S for the moon at the end of the eclipſe, juſt leaving the earth's ſhadow at W.

The point N denotes the inſtant when the eclipſe begins, the point F the middle of the eclipſe, and the point P the end of the eclipſe.

ECLIPTIC, in aſtronomy, is that circle which the plane of the earth would mark out where it ſuppoſed to be extended to the heavens.

This therefore is that which the ſun ſeems to deſcribe in his annual courſe.

To explain the generation and nature of the ecliptic, and its diviſions, alſo of the ſecondaries of the ecliptic, and their uſes, and the terms uſed in aſtronomy depending upon them.

1ſt. Suppoſe an obſerver placed upon the earth, by extending his ſight every way equally, if not hindred, bounds the world by a ſpherical ſuperficies concentric with himſelf, (that is, with the earth) and judges all remote objects, whoſe diſtance is unknown, though really very unequally removed from one another, to be placed as it were in the ſame concave ſpherical ſuperficies; as for inſtance, he does the fixed ſtars, ſun, and moon itſelf. This ſphere, concentric to the earth and ſurrounding it, deſigned by the ſight, and beſpangled with the twinkling fixed ſtars, ſupplying the place of an abſolute ſpace, is conſidered at reſt; while we abſtract from the diurnal motion, whereby this entire ſphere, or rather the whole heavens, are revolved from eaſt to weſt in the ſame ſpace of twenty-four hours. But ſince by reaſon of the annual motion of the earth about the ſun, the ſun ſeen from the earth ſeems to move forward daily towards the more eaſtern ſtars, the ſun will ſeem to move in this immoveable ſphere or mundane ſpace; and its path marked among the fixed ſtars is called the ecliptic, becauſe the eclipſes of the luminaries happen only in this line; as was ſhewn above.

Having once ſettled the ecliptic, it is evident that as all the orbits of the planets about the ſun, are not in one plane, but each of the planets ſeen from the ſun, makes an excurſion, ſometimes on this ſide, ſometimes on that ſide of the way of the earth, marked among the fixed ſtars; ſo that the planets ſeen from the earth, make an excurſion ſometimes on this ſide, ſometimes on that ſide of the ecliptic, and even in the ſame points of their orbits ſeem to run off variouſly, according to the different ſituation of the earth. But their greateſt excurſion is contained within the boundaries of ten degrees; the aſtronomers therefore have called that tract which the ſun, moon, and planets ſeem to adorn with their motions, and which is a zone or belt, twenty degrees broad. (ten on each ſide of the ecliptic,) by the name of the zodiac, from the images of animals, which the fixed ſtars, in that tract, ſeem to repreſent. The number of the images, pitched upon by them, is twelve; either becauſe this number ſeems the fitteſt, for its being diviſible into parts without a remainder, as two, three, four, ſix, and twelve; or becauſe, while the ſun ſeems to run through the zodiac, in the ſpace of a year, there happen near upon twelve lunations, or the moon runs through all her phaſes twelve times. Theſe parts of the ecliptic and zodiac are called ſigns, and their marks are, Aries ♈, Taurus ♉, Gemini ♊, Cancer ♋, Leo ♌, Virgo ♍, Libra ♎, Scorpio ♏, Sagitarius ♐, Capricornus ♑, Aquarius ♒, piſces ♓. Every one of theſe ſigns is again divided into thirty equal parts, ſo that the whole circle (like all others) is divided into three hundred and ſixty. Though the ecliptic or any other circle has no beginning nor ending, properly ſpeaking; yet aſtronomers begin their reckoning from the firſt point of Aries, which the ſun is ſeen in when the days and nights are equal, and ſpring begins to the inhabitants of the northern hemiſphere, which alſo is the point of the common interſection of the ecliptic and equator. The reckoning is made from ♈ to ♉, ♊, and ſo on, till a return is made to ♈, the beginning again towards the ſame way that the ſun ſeems to move about the earth. And the motion or progreſs this way is ſaid to be *in conſequentia ſignorum*, or according to the order of the ſigns; namely, that according to which the ſun, moon, and almoſt the reſt of the planets ſeem to move: but that phænomenon, which is carried in the contrary order, or from ♉ to ♈, or from ♈ to ♓, is ſaid to be moved contrary to the order of the ſigns, or *in antecedentia*.

Becauſe the axis of the earth after ſeveral revolutions about the ſun, goes a little off from a ſite parallel to that it formerly had, deſcribing the ſuperficies of a cone, the images of the ſtars have removed from the ſigns of the zodiac, to which they originally gave names. And this happens not upon the account of the motion of the ſtars or the ecliptic, but becauſe the equator of the earth is moved together with the axis of the earth, ſo as that the interſections of the celeſtial equator, with the ecliptic, or equinoctial points, (and conſequently all the points of the ecliptic, as they are expreſſible by numbers) remove *in antecedentia*; and the images or the fixed ſtars ſeem to be transferred, in reſpect of them, *in conſequentia*.

If innumerable circles be ſuppoſed to be drawn through the poles of the ecliptic, cutting the ecliptic at right angles, which are called its ſecondaries, any point in the heavens may be referred to the ecliptic, by the help of them; that is, any phænomenon is underſtood to be in that point of the zodiac or ecliptic, in which ſuch a ſemi-circle, paſſing through the phænomenon, cuts the ecliptic. And the phænomena that are after this manner referred to the ſame point of the ecliptic, are ſaid to be conjunct, or in con-

conjunction; but such as are referred to the opposite points, are in opposition. If a quarter of the ecliptic lie between the points to which the appearances are referred, they are said to be in a quartile aspect, but if a third part of the ecliptic, in a trine aspect; lastly, if a sixth part of the ecliptic lie between them, they are said to have a sextile aspect.

Besides, an arc of the ecliptic intercepted between the beginning of Aries and the said point of intersection, and reckoned according to the order of the signs, is called, the longitude of that phænomenon or point, as the arc of a secondary, intercepted between the ecliptic and the said phænomenon or point of the heavens, is called its latitude; on which account these secondary circles are called circles of latitude. The latitude is either northern or southern; for the heavens are divided according to astronomers, by the ecliptic, (a celestial circle, because originally considered in the heavens) in the northern and southern hemisphere.

The obliquity of the ecliptic is one of the most important elements of astronomy, because it enters into the calculation of all spheric triangles, wherein the ecliptic and equator are concerned.

The obliquity of the ecliptic being equal to the sun's greatest declination, namely, when in the tropics; the meridian height of the sun's centre must therefore be observed with a good instrument on the day of the solstice, and its difference with the height of the equator at the place of observation will give the declination of the tropic. Or, more accurately; observe the sun's meridian altitude in each tropic, this will give their distance, half of which is the distance of each tropic from the equator, that is, the obliquity of the ecliptic.

Example. The true height of the sun's centre in the winter solstice 1743, was observed to be 17° 40′ 7″; and in the following summer solstice 1744, it was found to be 64° 37′ 17″. Their difference 46° 57′ 10″ gives the sum of the declinations of the two tropics, half whereof 23° 28′ 35″ is the obliquity of the ecliptic.

This obliquity being known, the relation of all the points of the ecliptic to the equator is determined by a very simple operation; that is, the right ascension and declination of these points are easily found.

Example, Let S be a given point in the ecliptic I C G, distant 28° 0′ 0″ from the first point of ♈, or C. Draw from the point S the arc S O perpendicular to the equator D C B, which is the declination of the point S, and the arc C O of the equator is its right ascension. Now, in the rectangled triangle O S C where the angle S C O is 23° 28′ 35″, and the hypothenuse C S 28° 0′ 0″, there is found O S = 10° 46′ 44″, and O C = 25° 59′ 55″, for the sun's right ascension and declination when in ♈ 28° 0′ 0″.

Among the astronomical tables, some are found which give the right ascension and declination to every degree, and even to every minute of the ecliptic.

It has been a subject of controversy amongst astronomers, whether the obliquity of the ecliptic be variable or not; that is, whether the angle between the planes of the ecliptic and equator, continues always unchangeably the same, or is subject to alteration: it is also disputed among these writers who hold it liable to change, whether that change be regular or irregular. It is certain that the obliquity of the ecliptic is at present found to be above a third part of a degree less than Ptolemy has given it us. From Ptolemy's time down to Tycho, some observations have made it less, and others more, by a few minutes. They who will have the obliquity to have been always the same as it is at present, surmount all these difficulties, by throwing upon the inaccuracy of the observations of the ancients, and the imperfection of their instruments, all the differences found between them and the moderns: others think this is treating the ancients with too little respect; for though it appears by Ptolemy, that they did not pretend to observe more nicely than to a sixth part of a degree, and their instruments fell far short of those made use of by the moderns; yet it can hardly be imagined, they could be so greatly mistaken in a matter so easy to be known, and so well deserving their attention. As for those who suppose that the obliquity is subject to a sort of libration, increasing in some ages, and decreasing in others, they attribute a greater degree of exactness to the observations on which they ground this fancy, than they ought. Some have imagined that the obliquity has been always gradually decreasing, the planes of the ecliptic and equator growing continually nearer to a coincidence. This opinion, besides its being founded upon a comparison of ancient and modern observations, receives a good deal of support from the consideration of the figure of the earth.

Now, after proper allowances, the obliquity of the ecliptic comes out from the observations of the ancients above a third part of a degree greater than the modern astronomers have found it. Louville, after comparing all the ancient observations, was of opinion, that the obliquity of the ecliptic decreased at the rate of 1′ in a hundred years, and, from a great number of observations of his own, about the year 1711, set it down 23° 28′ ½, which is ½ a minute less than Flamstead and De la Hire made it: he goes farther, and thinks he discovered it to be five seconds less in the year 1720, than he observed it in 1714. But, notwithstanding the great care with which his observations appear to have been made, such a degree of exactness, as is here pretended, is hardly credible.

A TABLE of the OBLIQUITY of the ECLIPTIC.

	Authors Names.	Yrs. before Chriſt.	Obliquity.
L.	Pytheas — —	320	23° 49′ 23″
	Eratoſthenes — —	230	23 51 20
		After Chriſt.	
	Ptolemy — —	140	23 48 45
F.	Almamon — —	832	23 35
	Albatennius — —	890	23 35
F.	Thebet — — —	911	23 33 30
F.	Abul Wafi and Abu Hamed	999	23 35
F.	Perſian Tables in Chryſococcea — — —	1004	23 35
F.	Albatrunius — —	1007	23 35
F.	Arzakel — — —	1104	23 33 30
F.	Almeon — — —	1140	23 33 30
F.	Chojah Naſſir Oddin —	1290	23 30
F.	Prophatius the Jew —	1300	23 32
F.	Ebn Shatir — —	1363	23 31
	Ulug Beigh — —	1437	23 30 17
R.	Purbachius and Regiomontanus — — —	1460	23 28
R.	Waltherus — — —	1476	23 30
R.	Wernerus — — —	1510	23 28 30
	Copernicus — — —	1525	23 28 24
R.	Egnatio Danti — —	1570	23 29
	Prince of Heſſe — —	1570	23 30
	Tycho Brahe — —	1584	23 31 30
	Wright — — —	1594	23 30
	Ricciolus — — —	1646	23 30 20
F.	Hevelius — — —	1653	23 30 20
L.	Caſſini — — —	1655	23 29 15
	Richer — — —	1672	23 28 54
	De la Hire — — —	1686	23 29
	Flamſtead — — —	1690	23 29
L.	Bianchini — — —	1703	23 28 25
	Roemer — — —	1706	23 28 41
	Louville — — —	1715	23 28 24
	Godin — — —	1730	23 28 20
	Caſſini's Elements d'Aſtronomie — —	1738	23 28 20
	Dr. Bradley — — —	1766	23 28 8

The letter F. on the ſide of the table intimates the obſervation to be taken from Flamſtead; R. from Ricciolus's Almageſt; L. from Louville; and thoſe without a letter are from the authors themſelves.

The change in the obliquity of the ecliptic, which, very probably, may be cauſed either, 1, by a change in the inclination of the earth's axis, the plane of the earth's orbit continuing immoveable; or, 2, by a change in the plane of the earth's orbit, the axis of the earth continuing parallel to itſelf; or, 3, by a change both in the inclination of the axis and in the ſituation of the earth's orbit. The firſt of theſe ſeems moſt likely to be the caſe; for if we conſider the ſhape of the earth, that it is an oblate ſpheroid, or a globe a little flatted like a turnep, having its diameter at the poles a little ſhorter than at the equator; and that, by reaſon of this figure of the earth, the attraction of the heavenly bodies will act upon it in the ſame manner as if it had a ring round the equator; and that the ſun, being in the plane of the ecliptic, is perpetually pulling this ring, or the protuberant parts about the equator of the earth, towards a coincidence with the plane of the ecliptic; which action of the ſun, together with the like attraction of the moon, is the cauſe of the preceſſion of the equinoxes; and if this be conſidered, it will not appear improbable, that theſe actions of the ſun and moon, which have a continual tendency to bring the plane of the earth's equator nearer to the plane of the ecliptic, ſhould gradually diminiſh the angle between theſe planes. The moon indeed, being nearer to the earth, contributes more than the ſun towards this effect, by her attraction; for though ſhe be but twice a month in the ecliptic, yet ſince ſhe is always near it, never deviating much above five degrees from that circle; and theſe deviations are as much towards the north in one half of her period round the earth as they are towards the ſouth in the other; they will ſo balance one another, that the effect of the whole attraction of the moon will be pretty much the ſame, as if ſhe were carried round the earth exactly in the plane of the ecliptic. However, all changes in the poſition of the ecliptic are not to be abſolutely excluded; for, as the planets move round the ſun in different planes, their mutual attractions muſt have a tendency to change the ſituation of all their planes, and bring them nearer to a coincidence with one another: but then the diſtance of the planets from each other is ſo great, that the change here mentioned may be ſo exceedingly ſmall as not to become ſenſible in many ages.

ECLOGUE, in poetry, a little elegant compoſition in a ſimple natural ſtyle.

The word is derived from the Greek εκλεγω, to ſelect.

The eclogue, in its primary intention, is the ſame thing with the idyllium; but cuſtom has likewiſe made ſome difference between them, and appropriated the name eclogue to pieces wherein ſhepherds are introduced; and idyllium to thoſe written like eclogues, but without any ſhepherds in them.

The eclogue then is properly an image of the paſtoral life; therefore the matter is low, and its genius humble. Its buſineſs is to deſcribe the loves, ſports, piques, jealouſies, intrigues, and other adventures of ſhepherds; ſo that its character muſt be ſimple, the wit eaſy, and the expreſſion familiar. The true character then of the eclogue is ſimplicity and modeſty: its figures are neat, the paſſions tender, the motions eaſy; and though ſometimes it may have little tranſports and deſpairs, yet it never riſes ſo high as to be fierce or violent. Its narra-

tions

tions are short, descriptions little, the thoughts ingenious, the manners innocent, the language pure, the verse flowing, the expressions plain, and all the discourse natural.

The models in this sort of poetry are Theocritus and Virgil, who both have some eclogues of a lofty character: the eclogue, therefore, occasionally raises its voice. Yet M. Fontenelle esteems it a fault in some modern poets to have put matter of high concern in their eclogues, and made their shepherds sing the praises of kings and heroes.

Some imagine the name eclogue to have been originally applied to such poems as were written in imitation of others; such are the eclogues of Virgil, which are only imitations of Theocritus.

ECLOGUE is also applied to certain compositions in prose: such are those of Strabo, Diodorus, &c. in which sense the word signifies only an extract, or collection.

ECOUTE, in the manege, a pace or motion of a horse, when he rides well upon the hands and the heels, is compactly put upon his haunches, and hears or listens to the heels or spurs, and continues duly ballanced between the heels, without throwing to either side. This happens when a horse has a fine sense of the aids of the hand and heel.

ECPHORA, in architecture, commonly signifies the distance between the extremity of a member or moulding, and the naked part of the column, or any other part it projects from. Some authors, however, account for the ecphora from the axis of the column, and define it to be the right line intercepted between the axis and the outermost surface of a member or moulding.

ECPHRACTICS, in medicine, remedies which attenuate and remove obstructions.

ECPIESMA, in surgery, a sort of fracture of the cranium, when the bones are much shattered, and, pressing inwardly, affect the membranes of the brain.

ECPIESMA, in pharmacy, signifies the mass remaining after the juices of vegetables have been pressed out; and, in this sense, is the same as magna. It sometimes further imports the juice pressed out.

ECTASIS, in grammar, the same with diastole. See the article DIASTOLE.

ECTHESIS, in church history, a confession of faith, in the form of an edict, published in the year 639, by the emperor Heraclius, with a view to pacify the troubles occasioned by the Eutychian heresy in the Eastern church.

ECTHLIPSIS, ἐκθλιψις, among Latin grammarians, a figure of prosody, whereby the *m* at the end of a word, when the following word begins with a vowel, is elided, or cut off, together with the vowel preceding it, for the sake of the measure of the verse: thus they read *mult' ille*, for *multum ille*.

ECTROPIUM, in surgery, is an inversion of the eye-lids, when they are so retracted that their interior red skin becomes prominent, and the eye cannot be sufficiently covered by them.

The word is derived from the Greek, ἐκτρεπω, to invert.

ECTYLOTICS, in pharmacy, remedies proper for consuming callosities. See the article CALLUS.

ECTYPE, in antiquity, is an impression of a medal, seal, or ring; or a figured copy of an inscription, or other ancient monument.

The word is derived from the Greek, ἐκ and τυπος, resemblance; because it resembles the original.

ECU, or ESCU, a French crown; for the value of which see the article EXCHANGE.

ECUSSON, in heraldry, a little escutcheon.

EDDISH, or EADISH, the latter pasture or grass that comes after mowing, or reaping; otherwise called eagrass, earsh, and etch.

EDGINGS, in gardening, a series of plants set joining to each other round the edges or borders of flower beds. The principal use of edgings is to keep the earth in borders adjoining to gravel walks from being washed down in heavy showers, and thereby fouling the gravel; for which purpose there is no plant so proper as the dwarf Dutch box; though others are made use of, as daisies, thrift, thyme, &c. but as these are liable to decay in patches, and require annual or at least biennial replanting, we cannot much recommend them; but for those who are fond of an edging that bears flowers, there are none more agreeable than the double pheasant-eyed pink, or double daisy.

EDHELING, *Edhelingus*, the same with Atheling. See the article ATHELING.

EDICT, *Edictum*, in matters of polity, an order or instrument, signed and sealed by a prince, to serve as a law to his subjects.

EDIFICE, the same with building. See BUILDING.

EDILE, or ÆDILE. See ÆDILE.

EDITOR, a person of learning, who has the care of an impression of any work, particularly that of an ancient author.

EDUCATION is the bringing up and forming the minds of children, either in point of learning or good manners.

The word is formed from the Latin, *educo*, to bring up.

EDULCORATION, in pharmacy, the same with dulcifying. See the article DULCIFYING.

EDULCORATION, in chemistry, is the sweetening or clearing of any matter from impurities, especially the salts it may be impregnated with, by washing it thoroughly in common water; so that it is the same with ablution.

The word is derived from the Latin *edulcoro*, to sweeten, and that from *dulcis*, sweet.

EHRETIA, in botany, a genus of pentandrious plants, whose flower is monopetalous, the tube longer than the cup, and the border cut in five segments.

The fruit is an unilocular roundish berry, containing four seeds, convex on one side, and angulated on the other.

EEL, *Anguilla*, in ichthyology, a species of muræna. See the article MURÆNA.

EEL-BACKED, an appellation given to such horses as have black lists along their back.

EEL-SPEAR, a forked instrument with three or four jagged teeth, used for catching of eels: that with the four teeth is best, which they strike into the mud at the bottom of the river, and if it strike against any eels, it never fails to bring them up.

EFFECT is that which results from, or is produced by, any cause. See CAUSE.

EFFECTIONS, in geometry, are used in the same sense with the geometrical construction of propositions, and often of problems and practices, which, when they are deducible from, or founded upon, some general proposition, are called the geometrical effections thereunto belonging.

EFFERVESCENCE, in a general sense, signifies a slight degree of ebullition in liquors exposed to a due degree of heat. But the chemists apply it to that ebullition which is excited when two substances of different natures, an alcali, for example, and an acid, are mixed together. If the effervescence produces a heat in the substance so mixed, it is called a hot effervescence; but, if no heat is excited, it is a cold effervescence.

EFFICACIOUS, a term used by divines, in speaking of grace; importing such grace, as never fails to produce its effect. See GRACE.

EFFLORESCENCE, among physicians, the same with exanthema. See the article EXANTHEMA.

EFFLUENT FEVER, the same with an inflammatory one. See the article INFLAMMATORY.

EFFLUVIA, minute particles which exhale from bodies.

The word is derived from the Latin *ex*, from, and *fluo*, to flow.

EFFUSION, in a general sense, the pouring out of any thing liquid, and that with some violence.

EFT, in zoology, the English name of the common lizard, *lacertus vulgaris*, called also, in several parts of the kingdom, the newt and swift. See the article LIZARD.

EGG, *Ovum*, in natural history, a body formed in certain females, in which is contained an embryo, or fœtus, of the same species, under a cortical surface or shell.

EGG, in architecture, is an ornament in that form, cut in the echinus or quarter round of the Ionic and Compositе capitals. The profile or contour of an echinus is enriched with eggs and anchors placed alternately.

EGG-PLANT, melongena, in botany. See the article MELONGENA.

EJACULATOR, a muscle of the penis, otherwise called the elevator.

EJECTA, a term used, by lawyers, for a woman deflowered, or cast from the virtuous.

EJECTION, in the animal œconomy, evacuation, or the discharging any thing through some of the emunctories, as by stool, vomit, &c.

EJECTMENT, *Ejectione Firmæ*, in law, a writ, or action, which lies for the lessee for years, on his being ejected, or put out of his land before the expiration of his term, either by the lessor, or a stranger. It may also be brought by the lessor against the lessee, for rent in arrears; or holding over his term, &c.

EIGHT, or PIECE OF EIGHT. See the article EXCHANGE.

ELABORATORY, the place where chemical processes are performed. See CHEMICAL *Laboratory*.

ELÆAGNUS, oleaster or wild olive, in botany, a genus of plants whose flower is apetalous, the cup is a monophyllous, quadrific, rough, coloured perianthium, with four short filaments, topped with oblong incumbent antheræ. the fruit is an ovate, obtuse, and smooth drupe, including an oblong nut or kernel.

ELÆOSACCHARUM, in pharmacy, a preparation of some essential oil with sugar, thus performed: grind an ounce of dry loaf-sugar to an impalpable powder, in a glass mortar, and with a glass pestle, and by degrees add thereto a dram of any essential oil, or only half a dram, if the oil be very tenacious; and continue rubbing them together, till all the oil be thoroughly mixed, and drank in by the sugar. If a little fresh white of an egg be added in the grinding, the oil becomes thereby more easily miscible; but the mixture will not keep so long, without turning rancid.

If these elæosaccharums be well prepared, dried, and put into clean glasses, exactly closed with glass stoppers, they may be preserved a long time perfect. By this method, therefore, you may prepare an excellent medicine, rich in virtue: for if the elæosaccharum of mint be dissolved in distilled mint-water, then strengthened with the addition of spirit of mint, and the mixture sweetened with the syrup of the same plant, the whole virtues of mint may be thus obtained.

ELAPHOCAMELUS, in zoology, the same with the glama, or Peruvian camel. See GLAMA.

ELASTIC, in natural philosophy, an appellation given to all bodies endowed with the property of elasticity.

ELASTICITY, that power or property in natural bodies, by which they reſtore themſelves ſpontaneouſly to the figure and dimenſions which they had loſt by the action of ſome other body applied to them.

Thus a ſpring or bow, when bent, reſtore themſelves, by their elaſticity to the form they obtained before any external force was applied to them. And thus the arteries of an animal body, after being diſtended by the impulſe of the blood, contract and reſtore themſelves, by their elaſticity, to the ſame form and dimenſions they had before they were thus diſtended. Some have endeavoured to ſolve elaſticity by attraction only; as for example, if the ſtring A B (Plate XLVI. *fig.* 1.) be conſidered as made up of particles lying over one another in the manner repreſented at A D B; it is plain that, if the point D be forcibly brought to C, the parts will be pulled from each other; and when the force that ſtretched the ſpring ceaſes to act, the attraction of coheſion, which was hindered before, will take place, and bring back the ſtring to its former length and ſituation, after ſeveral vibrations. Now, though this ſeems to agree pretty well with the phænomena of a ſtring in motion, it will by no means ſolve the elaſticity of a ſpring faſtened to one end, and bent either way at the other, like a knife or ſword blade. For if ſuch a ſpring be bent from A to *a*, (*fig.* 2.) the particles on the ſide C, which now become convex, will be farther aſunder at F, while the particles at D, carried to the concave part E, will come cloſer together: ſo that the attraction, inſtead of making the ſpring reſtore itſelf, will keep it in the ſituation in which it is, as it happens in bodies that have no elaſticity, where, perhaps, only attraction obtains. Thus a plate of lead, a plate of copper, and a plate of ſoft iron ſtand bent.

But the moſt probable way of ſolving the elaſticity of ſprings, is to conſider both a repulſive, and an attractive property in the particles, after the manner of the black ſand, which is attracted by the load-ſtone, and has been ſhewn by the learned and ingenious profeſſor Petrus Van Muſchenbroeck to be nothing elſe but a great number of little load-ſtones.

The great law of perfectly elaſtic bodies, is, that their relative velocity will remain the ſame before and after colliſion; that is, perfectly elaſtic bodies will recede from one another after the ſtroke, with the ſame velocity that they came together. Many curious phænomena may be explained from this property in bodies.

If the ivory ball A, (*fig.* 3.) weighing two ounces, ſtrike with the velocity 16 againſt B at reſt, weighing alſo two ounces; the body B will move forward after this ſtroke with the velocity 16, A remaining at reſt in its place: the reaſon of this is, that the body A loſes one half of its motion by ſtriking the equal body B, and the other half by the elaſticity of B, recovering its former figure. From this experiment, ſeveral pretty odd phænomena ariſe: thus, if a row of ſhovel-board pieces, that is, metalline cylinders of about half an inch in height, and two inches diameter, be laid upon a ſmooth table, and you take a ſingle piece, and drive it againſt the row, the laſt piece off the row will fly off: for if A (*fig.* 4.) ſtrike the row of pieces B, C, D, E, F, G, H, I, in the direction A *a*, then will the laſt piece I, fly off to *i*, with the ſame velocity that A ſtruck B: and whatever be the velocity of A, no other piece but the laſt piece I, will fly off. But if you take two pieces, as A and B, (*fig.* 5.) and ſtrike them together againſt the row C, D, E, F, G, H, I, the two laſt pieces H and I, will fly off from the other end of the row with the ſame velocity that A and B made the ſtroke.

If three or more pieces are made uſe of to make the ſtroke, the very ſame number will fly off from the other end of the row; and it is to be obſerved, that the ſame will happen with equal elaſtic balls, ſuſpended in a row by ſtrings of the ſame length.

Again, if the elaſtic body A, (*fig.* 6.) weighing four ounces, ſtrike the quieſcent body B, weighing only two ounces, with a velocity equal to 12; then will the velocity of A, after the ſtroke, be 4, and that of B 16. Juſt the reverſe of this happens, when a leſſer body ſtrikes againſt a greater; in which caſe, the ſtriking or leſſer body will be reflected with one fourth of its firſt motion, and the greater be carried forward with a motion which is as 16.

The magnitude and motions of ſpherical bodies perfectly elaſtic, and moving in the ſame right-line, and meeting each other, being given, their motion after reflection may be determined thus: Let the bodies be called A and B, and the reſpective velocities *a* and *b*; then, if the bodies tend the ſame way, and A, moving ſwifter than B, follows it, the velocity of the body A, after the reflection, will be $\frac{aA - aB + 2bB}{A + B}$, and that of the body B $= \frac{2aA - bA + bB}{A + B}$; but if the bodies meet, then, changing the ſine of *b*, the velocity of A will be $\frac{aA - aB - 2bB}{A + B}$, and that of B $= \frac{2aA + bA - bB}{A + B}$: and if either of theſe happen to come out negatives, the motion after the ſtroke tends the contrary way to that of A before it; which is alſo to be underſtood of the motion of the body A in the firſt caſe.

ELATERIUM, in pharmacy, imports in general any purging medicine; but is particularly applied to thoſe which operate with violence; hence the word was transferred to the wild cucumber and the preparations thereof. See MOMORDICA.

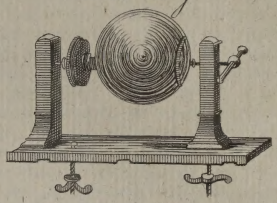
ELATERIUM, in botany, a name by which Boerhaave calls the momordica of other botaniſts. See MOMORDICA.

Elasticity.

Fig. 1.

Fig. 2.

Electricity.



Elasticity Fig. 3.

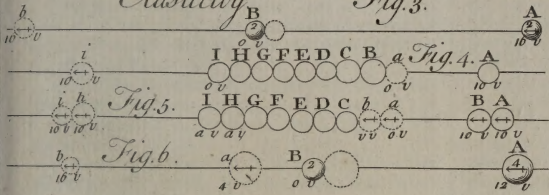
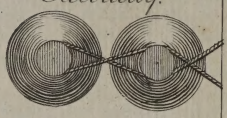


Fig. 4.

Electricity.



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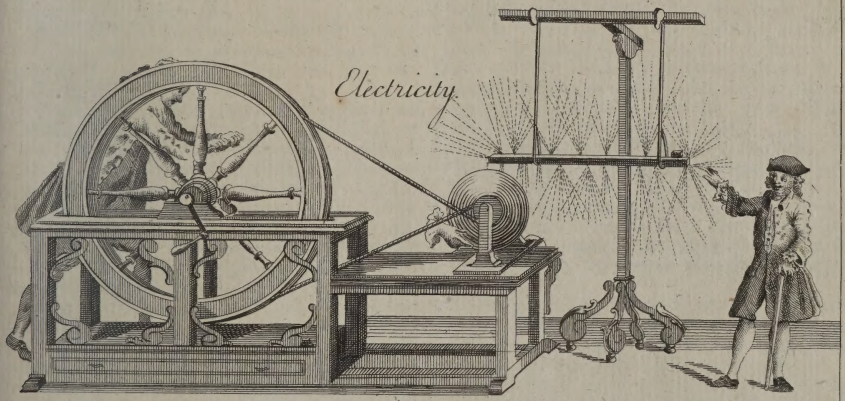

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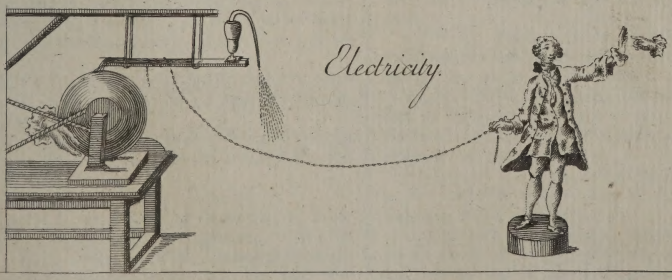


T. Ledger Sculp.

ELATINE Fluellin, in botany, an annual plant which grows naturally among corn in ſeveral parts of England. It hath a white, ſingle, deſcendent, ſlender root, with few fibres. The ſtalk is ſlender, and trails on the ground: this is hairy, and furniſhed with acuminated leaves, which are placed alternately with very ſhort pedicles; at each joint proceeds a ſingle flower of the ringent kind, ending in a tail behind, and in the fore part divided into two lips; the upper one of a yellow colour, and the under one purple. The flowers appear in June and July; and the ſeeds ripen in autumn.

This plant is uſed in medicine, and is accounted a great vulnerary, and good for hæmorrhages of all ſorts. It is alſo ſaid to cure the gout, cancers, leproſy, and king's evil.

ELBOW, in anatomy, the juncture of the cubitus and radius; or the outer angle made by the flexure, or bend of the arm. See Cubitus and Radius.

Elbow, in architecture, a term uſed for an obtuſe angle of a wall, building, road, &c. which divides it from its right-line.

ELCESAITES, in church hiſtory, ancient heretics, who made their appearance in the reign of the emperor Trajan, and took their name from their leader Elceſai.

The Elceſaites kept a mean between the Jews, Chriſtians, and Pagans; they worſhipped but one God, obſerved the Jewiſh ſabbath, circumciſion, and the other ceremonies of the law. They rejected the Pentateuch, and the Prophets; nor had they more reſpect for the writings of the apoſtles, particularly thoſe of St. Paul. They deteſted chaſtity and continence, and obliged their diſciples to marry. They acknowledged a Meſſiah, whom they called their great king; but we do not know whether they meant Jeſus Chriſt, or ſome pretended Meſſiah. They gave him a human form, but inviſible; the dimenſions of which were thirty-eight leagues in height, and ſo in proportion. They pretended that the Holy Ghoſt was a woman, and of the ſame ſize with the Meſſiah. They were much addicted to judicial aſtrology, magic, and enchantments: they held that it was lawful to renounce the faith with the lips, provided a man kept it in his heart.

ELDER, or Seniors, in Jewiſh hiſtory, were perſons the moſt conſiderable for age, experience, and wiſdom.

Elder is alſo a denomination ſtill preſerved in the preſbyterian diſcipline. See the article Presbyterian.

Elder, in botany. See Sambucus.

ELEATICS, a ſect of philoſophers of Elea, founded by Xenophanes, a Colophonian. He held all things to be incomprehenſible, but withal maintained many dogmatical aſſertions. He held that God is one, incorporeal, eternal, all ſight, and all hearing, no way reſembling man: that this God is all things; that whatever is, is eternal; that there are infinite worlds, and thoſe immutable and eternal; that there are four elements; that the ſtars are certain clouds, ſet on fire when they riſe, and extinguiſhed when they ſet; that all comets, falling ſtars, and the like, are clouds, kindled by motion; that the ſun is a fiery cloud, extinguiſhed in its eclipſes; that the moon is a cloſe, compact, and habitable cloud; that there are many ſuns and moons in the ſeveral climates of the earth; that the ſun promotes generation, but the moon contributes nothing to it; that the ſun goes forward infinitum, but to us ſeems to move circularly by reaſon of the great diſtance; that the clouds are a vapour drawn up by the ſun; that the earth was firſt founded and rooted, as it were, in an infinite depth; that the ſoul is a ſpirit; and that all divination is falſe, &c.

ELECAMPANE, in botany, a large plant, with long, wrinkled, oval, acuminated leaves, ſerrated about the edges, pale green above, and hoary underneath, joined cloſe to the ſtalk, which divides towards the top into ſeveral branches, bearing large yellow flowers of the radiated diſcous kind, followed by oblong ſeeds, winged with down: the roots are ſhort and thick, ſomewhat unctuous to the touch, brown, or blackiſh on the outſide, and whitiſh within. It is perennial, grows wild in moiſt rich ſoils, and flowers in June.

The freſh roots of elecampane have a weak, not very grateful ſmell; which, on thoroughly drying, and keeping them for ſome time, is greatly improved, and approaches to that of Florence orris. Chewed, they diſcover at firſt a kind of rancid glutinous taſte, quickly ſucceeded by an aromatic bitterneſs, which by degrees becomes conſiderably pungent.

This root ſtands recommended as a diaphoretic, ſtomachic, for promoting expectoration in humoural aſthmas and coughs, and for attenuating viſcid juices in general, and diſpoſing them to execretion: taken freely, it is ſaid to gently looſen the belly, and increaſe the urinary diſcharge. The doſe of the dry root in ſubſtance is from a ſcruple to a dram or two.

ELECT, *Electi*, among eccleſiaſtical writers, thoſe whom God has choſen, or predeſtinated to be ſaved. See the article Predestination.

ELECTION, the choice that is made of a perſon, or thing, in preference of any other; as, in election of an emperor, of a pope, of a biſhop, of members of parliament, &c.

Election is alſo the ſtate of a perſon who is left to his own free will, to take or do one thing or another, which he pleaſes.

Election, in theology, ſignifies the choice which God, of his good pleaſure, makes of angels and men for the objects of his grace and mercy.

ELECTOR,

ELECTOR, a perſon who has a right to elect or chooſe another to an office, honour, &c.

Elector is particularly, and by way of eminence, applied to thoſe princes of Germany, in whom lies the right of electing the emperor; being all ſovereign princes, and the principal members of the empire.

ELECTORAL CROWN, or CORONET. See the article CROWN.

ELECTORATE, a term uſed as well to ſignify the dignity of, as the territories belonging to, any of the electors of Germany.

ELECTRICITY, a power or property in ſome bodies; as amber, ſealing-wax, &c. whereby they attract light bodies.

As the power and various phænomena of electricity, which of late have been invented and exhibited in experiments, have greatly amuſed mankind, and juſtly raiſed their wonder and ſurprize, it is but natural to expect they ſhould appear very anxious about the cauſes thereof, or manner of accounting for it; and alſo extremely inquiſitive concerning the uſes that may be made of ſuch an amazing efficacy.

As to the firſt of theſe particulars, viz. the cauſe of electricity, and the manner of accounting for its effects, there have been many hypotheſis formed to ſolve them; but they have been chiefly invented by men, who have appeared to underſtand little or nothing of true philoſophy; or elſe to have been ſo affected with novelty and ſingularity, that the principles they advance are more doubtful and myſterious than the cauſes and properties of the electric virtue they account for by them. We hear people conſtantly debating on this head, as if Sir Iſaac Newton and his philoſophy, had never been head of, or read.

For my own part, I have been always perſuaded we ſhall never arrive at the cauſe of electricity, unleſs we purſue our enquiries by the clue given us by that great man. That is to ſay, the nature, cauſe, properties, and effects of electric virtue, are explicable only on the principles of the Newtonian Doctrine of Light and Fire. This is therefore, in the firſt place, to be premiſed, and which I ſhall lay down under the following heads, *viz.*

Firſt, We find by experience, that the parts of all bodies when agitated to a certain degree, do ſo act upon animal bodies as to excite the ſenſation of warmth or heat.

Secondly, Such an agitation or inteſtine commotion of the parts of bodies may be effected by various means; as friction, percuſſion, fermentation, vital motion, the action of light, *&c.*

Thirdly, The ſtandard degree of warmth or heat, is that of an animal body; or, in other words, if the parts of any body have a greater motion than the parts of the animated body, as the hand, we ſay it is warm or hot; but if they have leſs motion than thoſe of the hand, we ſay they are cold. Laſtly, if the motion of the parts are the ſame in both, we then ſay, ſuch a body is neither hot or cold. And hence it appears, that the ideas of heat and cold are only in a comparative degree.

Fourthly, The parts of bodies when agitated, or heated beyond a certain degree, emit or throw off ſuch fine ſubtle particles, or effluvia, which ſhine or excite the idea of light; and which therefore we generally call particles of light.

Fifthly, When the parts of the body are ſo violently agitated, that they not only throw off lucid particles, but alſo ſhine themſelves, then we ſay, it is a body of fire, when the particles are not in a fuming ſtate; but when they are, we call that lucid fume a flame of fire.

Sixthly, The intenſity of the action of ignited bodies depends as well on the denſity, as the velocity, of the parts; and when both theſe are in an extreme degree, the momentum, or whole force of the heat becomes intolerable, and inconſiſtent with the ſtate of a natural body; and its action is, in this caſe, what we call burning.

Seventhly, There are ſome caſes where the parts may have ſufficient velocity to appear lucid, but not be denſe enough, at the ſame time, to burn.

Eighthly, The motion with which the parts of bodies are thus agitated to emit light, and heat, is of the vibrating kind; becauſe the motions and directions of the particles in this caſe may become uniform, conſonant, and harmonious; and all conſpire to produce the effects which they could not do by a confuſed contrary motion of parts.

On theſe principles Sir Iſaac Newton accounts very clearly for many of the wonderful phænomena of nature, eſpecially of the phoſphoreal and electrical kinds. For inſtance; the ſhining of ſea-water in a raging ſtorm; of quick-ſilver agitated in vacuo; of wood, fleſh, and fiſh, by putrefaction; the ignis fatui; of ſtacks of corn, hay, &c. by fermentation, growing wet, and firing; the glowing of ſome worms, inſects, and eyes of animals, by vital motions; of phoſphorus, by attrition, or the action of the acid particles of air; of iron hammered very nimbly, till it becomes red-hot; of the melted parts of ſteel ſtruck off by a flint; of axle-trees fired by the rapid rotation of the wheels; and of the mixture of ſome ſorts of fluids, producing great heat, accenſion, and exploſion.

But moſt expreſly and largely, he applies this theory to a general explication of the production of electricity. He tells us, the glaſs globe, by attrition with the hand, will ſhine, and emit ſuch an electric vapour, as by ſtriking againſt paper, cloth, or the finger, will be put into ſuch an agitation as to emit light, and make the paper, *&c.* appear lucid, like a glow-worm; and in ruſhing out of the glaſs, it will ſometimes puſh againſt the finger, ſo as to be felt. Thus far Sir Iſaac.

The

Electricity.

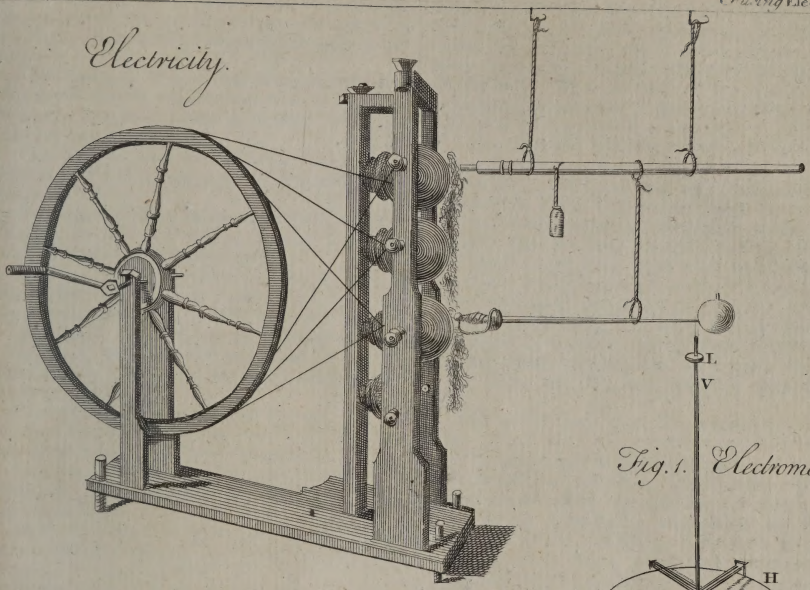
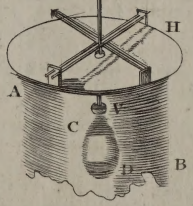


Fig. 1. Electrometer.



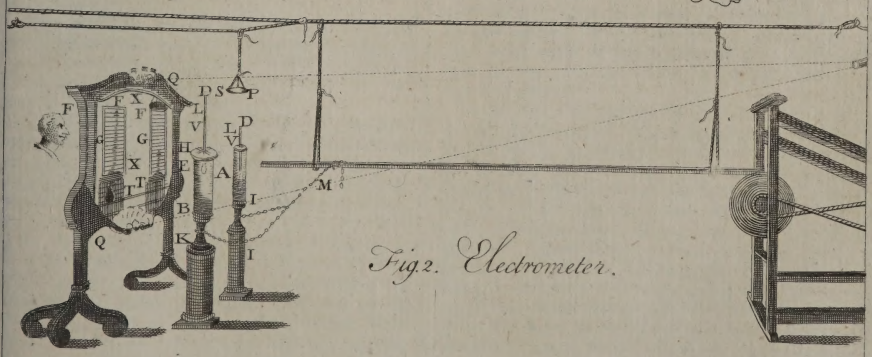


Fig. 2. Electrometer.

The above theory of light and fire will, I think, be nearly sufficient to solve all the phænomena of electricity; which I shall enumerate in order as follows.

Phænomena I. The electric virtue consists in a fine subtile matter, emitted from some sorts of bodies under the circumstances of attrition, which bodies are called electrics *per se*.

Phænom. II. This virtue will not be excited in some sorts of bodies, which therefore are called non-electrics.

Phænom. III. This virtue repels all light bodies lying on the surface of that in which it is excited, which is termed the electrified body.

Phænom. IV. This virtue attracts all sorts of light substances within the space of its action, and then repels them again from the electrified body.

Phænom. V. It suffers not the body once repelled to approach the electrified body, till it has first touched some other body, and then it will again attract it.

Phænom. VI. This virtue will run off upon, or be received by all non-electric bodies; but will be refused or restrained by all electrics *per se*.

Phænom. VII. This virtue, when excited to a sufficient degree, appears lucid, and shines in the dark like a flame.

Phænom. VIII. It is emitted with great velocity, attended with a snapping; or small, but fierce explosion.

Phænom. IX. The eruption of electric fire to a non-electric body, condenses the said fire; and as this fire is in a less or greater degree, it appears of a bluish purple, yellow, or white colour.

Phænom. X. It runs through any length of a non-electric body almost instantaneously.

Phænom. XI. It kindles any inflammable vapours or fume, and thereby sets the body on fire that emits it.

Phænom. XII. All the properties and effects of the electric virtue appear to be nearly the same, at any distance from the body in which it was first excited, and having passed through any number of intermediate non-electric bodies.

These are the principal phænomena of electricity, which we now proceed to give some account of from the principles of the above-mentioned theory. As to the first, there can be no doubt of the existence of such a subtile matter in the substance of bodies, or of its emission or effluvium, because it can be so easily demonstrated to the senses by experiments.

This subtile matter, or spirit, appears to be of an elastic nature, and acts by the reciprocations of its tremours, or pulses, which are occasioned by the vibrating motion of the parts of an electric body, excited by friction. Hence, as friction is necessary to excite a vibrating motion in the parts of bodies, in order to throw off the electric matter; it follows, that those bodies, whose parts, by friction, will not conceive a vibration, or put into an uniform reciprocating motion, will not prove electrical, or be productive of electricity: and the defect seems to arise from the want of a natural elasticity of the particles of the body. Thus the white of an egg in its natural state, or boiled to a greater consistence, is a non-electric; but when it is thorough dry and hard, it is then as brittle and yellow, and as electrical as amber itself.

Nor is it any thing less than the highest degree of elasticity in bodies that renders them capable of those vibrations which put the electric matter into action. For we observe the white of an egg boiled, and the strongest glues, when cold, are considerably elastic, yet are utterly non-electrical; even tempered steel itself, though so greatly elastic, shews no signs of electricity. In short, nothing less than that degree of elaterium, which makes bodies brittle, and break with a polish, as in grass, amber, rosin, pitch, wax, *&c.* will constitute them electrical.

The electric matter, as it is emitted from the body, enters into, and possesses every light non-electric body it meets with in its way, and carries it by impulse in its direction, *viz.* from the electric body, this we call the repulsive power of electricity. This electric spirit having impregnated the light body, and wholly possessed it, begins there to form a new sphere of action, or vibration; whose pulses being in a contrary direction to those of the electrical body, will cause the said light body to keep every where beyond the sphere of its activity, or to be constantly repelled by it. This is very evident by experiment.

Hence it is, that when two or more bodies are possessed of the same power, at the same time, they always repel each other; so the plumulæ of feathers, while the electric virtue is among them, repel each other. Thus it is also in magnetics; two needles touched on the same pole of a load-stone, repel each other, if put together by their touched ends on the surface of water, or suspended on the points of needles.

Hence also it is, that the electrical virtue will not run off the electrified body to another which is an electric *per se*; for though an electric body, in order to emit this virtue very copiously, must be excited by friction; yet we are to understand, that all electrics *per se* have naturally a vibrating motion of the parts, by which they emit this virtue in a less degree, and imperceptably; and so have each a proper sphere of action; and the pulses of each sphere being in contrary directions, cannot conspire and unite, but must restrain and cohibit each other. Thus the flame at the end of the iron, at the approach of a match, retires, and seems repelled by the contrary action of the brimstone, while it is greatly dilated at the distant approach of the finger, and rushes against it with a blast. Thus also it is in mag-

neſies *per ſe*; for two loadſtones placed on the water in baſons, or ſuſpended by ſtrings, with their two ſimilar poles together, will always repel each other. Therefore it is, that when we would conduct or communicate the electric virtue to any great diſtance by the mediation of any non-electric body; the ſaid body is either ſuſpended by ſilken ſtrings, which are electrical, or laid on cakes of roſin, that the virtue might not run off thereby.

The electric virtue in that part of its vibration, by which it returns to the excited body in each pulſe, meeting with light bodies in its way, impels them forcibly towards the electric body, and makes them appear to be attracted by that body; and ſo this is called the attractive power of electricity. But here it may be remarked, that electric bodies, if light, as well as others, are attracted; true, they are, but then they are not excited, and their natural vibration, or action, being very weak, will be overcome by the power of the excited and ſtronger electricity, and ſo carried or moved in its direction. It may likewiſe be farther objected againſt what I advanced above, that the natural efficacy of the ſilken ſtrings ſhould be too weak to reſtrain the excited electricity from entering its ſubſtance, and running off by it; but to this I anſwer, in the ſilk there is naturally a ſphere of action or vibration; in the electricity of the electrified body there is none, till it begins to be emitted from the extremity, or ſome other part; all the motion that it has in the electrified body being that which it firſt received from the excited body, and is continued and propagated in the electrified body by the natural vibration of its parts, which is weaker than that in the ſilk, and therefore it muſt paſs on by it, to make its exit at the end.

As to the lucidity of the electric effluvia, nothing more is requiſite thereto, but a certain degree of velocity, which is eaſily produced by attrition, according to article 4th of the Theory.

In order to account for the ſnapping or exploſion of the eruption of the electric fire, it is to be obſerved, that this exploſion, like all others, conſiſts in a violent concuſſion of the air, by a ſudden expanſion and burſting of the denſe ſtream or profluvium of the fire, in ſtriking againſt the non-electric body. Yea, ſometimes it will ſnap againſt, or in the air only, as when it ruſhes out of the mercurial phial through the pores of ſealing-wax. Now this exploſion muſt ariſe from that violent action among the electric particles which proceeds from the extreme degree of velocity that conſtituted a denſe body of liquid fire, (for it never ſnaps but in ſuch a caſe) and by that action, as it becomes more denſe, it becomes elaſtic; and at length, by daſhing againſt the ſurface of any body, it is more and more condenſed, and the inmate elaſticity ſo far increaſed, as to cauſe it to burſt, explode, or flaſh away in an inviſible vapour. And perhaps this, more adequately than gunpowder itſelf, repreſents to us the true caſe of lightning and thunder; nor can we here ſuppoſe the effects of ſulphur excluded; for as moſt metalic ſubſtances, ſo iron in particular, contains a great admixture of ſulphur; now ſome of thoſe ſulphureous particles may, by the intenſe action of the electric fire, be diſſolved and carried with it into the air, where the nitro-acid particles may conduce to the accenſion, and promote the exploſion we are ſpeaking of. And hence it may be, that the communication, action, and exploſion, from iron ſubſtances, are much more conſiderable than can be produced from any other.

Where the electric fire is not ſo much condenſed as to ſnap, or explode, it goes off in a large dilated ſtream of purple flame, and greatly reſembles the corruſcations of the aurora borealis, eſpecially that part of the aurora which appears in a conſtant ſtreaming light.

When the electric fire is but a little denſe, it appears of a bluiſh colour, as all other faint lights do; thus the moon-light, which is extremely weak, appears blue in candle-light: and when the ſaid fire is a little more denſe, it appears of a purple hue, and has a greater effect; a ſtill greater denſity makes it look yellow, like candle-light; but the greateſt denſity is ſhewn by a yellowiſh white, like the ſun's light, and then it produces the greateſt force of exploſion and percuſſion. As yellow lightning vaniſhes in an innocent flaſh; but white and denſe lightning produces terrible effects. So alſo phoſphorus, while agitated by a gentle friction, ſpends itſelf in a lambent innoxious blue flame; but when its action is heightened by a greater attrition or contuſion, it kindles into a white flame, and burns with an outrageous and unquenchable fire. Therefore the phænomena and effects of electricity, lightning, and phoſphorus, ſeem to be of a homologous nature, and to have ſomething that is eſſential and common to each.

That the electric fire ſhould ſhew itſelf, and produce its effects at any indefinite diſtance from the excited body, is nothing ſtrange or unaccountable, when we conſider it as a propagated fire, and of a ſimilar nature to lightning; for fire of this ſort loſes nothing, but rather is increaſed by its propagation, with reſpect to its efficacy. As lightning pervades ſoft and yielding ſubſtances unhurt, and proves the diſſolution only of hard and compact bodies, ſo electricity is not felt in the ſoft and muſcular part of the body, but ſtrikes the harder bones with a benumbing ſhock. And as thoſe denſer parts of lightning, which we call thunder-bolts, ſtrike againſt hard bodies, and glance by reflection to different parts, ſo the fire of electricity ſtriking againſt the lower part of the humerus, at the elbow of one arm, ſeems reflected from thence acroſs the breaſt to the elbow of the other arm, and from thence flies out of the body, if nothing be near it; but if ſeveral join hands

hands, it is almoſt inſtantaneouſly reflected from one to the other, through the arms and elbows of the whole company, be they ever ſo many. Laſtly, as lightning does inſtantly deprive an animal of life, by its deliterious ſtroke, when ſufficiently denſe, ſo the electric emanation may be ſo condenſed, and its force ſo encreaſed, as to ſtrike a bird quite ſenſeleſs, and ſometimes quite dead, in a moment. The parallel might be carried yet farther, between lightning and electric fire; but I have not room to enlarge.

Thus I have propoſed what I have to ſay, for a ſolution of the ſeveral phænomena of electricity; for the moſt part of which, I have the authority of an excellent theory, and the ſuffrage of a great many explicit and demonſtrative experiments, which I have ſubjoined for farther ſatisfaction and entertainment of the reader. Theſe experiments are ſuch as I daily ſhew in my courſe of philoſophy, and are therefore, indiſputable facts, and topics of argumentation.

But now I am reduced to the arduous taſk of anſwering this very common and important queſtion: "What is the uſe of this moſt wonderful and ſurpriſing property of bodies?" Not but that my anſwer is very ſhort, and if it were to be but once or twice repeated, would be very eaſy, viz. That at preſent I know ſo little of its uſe, as not to be able to form any rational conjecture about it. What we know of this kind muſt be diſcovered by experience. And as I am fully perſuaded all the powers of natural bodies were deſigned to anſwer very great purpoſes, yet what they are, are not diſcovered to us all at once, but by ſlow degrees. True philoſophy was but dawning a century ago; and can we think it ſtrange that any thing ſhould yet appear abſtruſe or difficult to account for? I rather wonder we have been able, in ſo ſhort a time, to diſcover ſo much relating to the uſes that may be made of it. As for inſtance, the analogy between the fire of electricity and lightning; between its ſnapping and thunder; between their forces and effects on animal bodies, and animal life; between electricity and common fire, in reſpect of velocity and combuſtion; between electricity and phoſphorus, in regard of its various degrees of light, colour of light, and manner of burning. Moreover, we know it has a conſiderable influence on fluid ſubſtances: a glaring inſtance is that of the ſyphon, and ſponge; by which it appears, that fluids in motion, have their motion greatly accelerated by the electric virtue. Thus, if a vein be opened in a perſon electrified, the effluent blood will project to a much greater diſtance, than it would otherwiſe do: and is not this a promiſing indication of ſome great uſe that may be one time or other derived to the animal œconomy from electricity?

Yea, farther, I know from my own experience, that different perſons are affected by the electric virtue in a very different manner; ſome prove extremely electrical, others very little ſuſceptible of it; and it has been found that a perſon poſſeſſed with the infection of the ſmall-pox, could by no means be electrified at all. Theſe are early and intereſting diſcoveries, and plainly intimate this wondrous efficacy was intended for ſomething more than meer amuſement to mankind. What relation it has to the animal ſpirits, or that which we mean by that term, in animal bodies, I know not, but muſt leave to older and wiſer heads to determine by a longer courſe of experiments. What I have ſaid, I ſubmit to the judgment of thoſe whoſe province it is to apply the diſcoveries of natural philoſophy to the utility and benefit of mankind. My buſineſs is chiefly to make the experiments, which I ſhall now proceed to deſcribe in all their proper circumſtances, as they are performed on a machine, conſiſting of a large wheel and glaſs globe, or ſpheroid, fixed in a large long frame of wood, made in moſt reſpects like that of Mr. Monnier, but more eaſy in operation, by means of friction wheels, on which the axle of the great wheel turns; the reſt of the apparatus will be mentioned in the ſequel of the following experiments:

Experiment I. On the axis, in the center of the globe, is fixed a circular ſtring of threads, at ſmall diſtances from each other; and when the globe is at reſt they all hang down by their gravity; but when the globe is put in motion, and a little heated, they all extend themſelves from the center to the circumference, or inner ſurface of the globe, which they very nearly touch, in right-lined directions, ſo as nearly to repreſent the ſpokes of a coach-wheel. This they do by the electric virtue acting ſtrongly upon them from the inner ſurface of the globe. And in this condition they will continue till the virtue ceaſes, and the globe becomes cold, when they gradually fall down, and take their firſt perpendicular directions.

Exp. II. The globe being whirled round, and the threads expanded as before, if the hand or any non-electric body be moved towards the ſurface of the globe, the threads within will ſeem immediately ſenſible thereof; and, as if animated thereby, will, in a very wonderful manner, move every way to the hand, by a motion like that we obſerve in the legs of a ſpider, eſpecially that ſort we call a carter, or father-long-legs. By this experiment we obſerve, the ſurprizing nature and ſubtilty of this kind of effluvia, as it is ſeen to penetrate and pervade the ſubſtance of glaſs with the ſame readineſs and freedom as if nothing were in the way to intercept it.

Exp. III. A hoop of fine threads being placed any how about the globe in motion, will have all the threads drawn out of their natural perpendicular directions into others which paſs through the center of the globe, and ſo will be all perpendicular to the ſurface, which makes a very pleaſing ſpectacle. By this

this experiment it appears, that the electric virtue acts equally both within-side and without the globe, and in directions perpendicular to its surface. Hence, also, we see the power of electricity is greater by far than gravity with us.

Exp. IV. The hoop of threads remaining about the globe in motion, as in the last experiment, if the room be darkened, the ends of the threads on the outside of the globe will be all tipped with fire, and make a beautiful apparition of stars: which shews, that the electric virtue is a fine thin bluish flame of fire, much like that of phosphorus gently rubbed in the dark. The threads within exhibit no appearance of light; which shews, that this virtue acts only outwardly, and by that means the threads within are drawn towards the surface.

Exp. V. A long, pointed piece of iron being laid on a frame of silken strings, with one end about a quarter of an inch from the globe, will, at the other end, which terminates in a conical point, emit a purple flame of electrical fire, diverging each way from the point, like the rays of the sun from the focus of a burning glass in a darkened room. This pencil of electric rays is visible even in the day-light, but is extremely so in a room made dark; and if the finger be held within a quarter of an inch, it causes the fire to issue out in a greater quantity, and to appear much more luminous than before.

Exp. VI. The finger being placed as above directed, within a quarter of an inch of the said flame, will be sensible of a gentle blast of wind from the end of the iron, that is, the electrical fire will issue out of the point in such a manner, as to blow against the finger very sensibly; and if the finger be held still nearer, the large pencil of rays will be condensed in such a manner as to run out of the point upon the finger in a stream, or body, of dense yellow fire, and strike the finger like a gentle jet d'eau; and, indeed, the phænomenon may be truly called a jet de feu. This electric flame, also, is sensible to the smell, and much resembles, in that respect, the fire of phosphorus.

Exp. VII. If, while the flame continues to appear from the point of the iron, the finger be placed any where upon the iron, the flame at the end disappears immediately; if the finger be taken off, it again does instantly appear; and so by putting the finger off and on successively, the electric flame will appear and disappear alternately. The reason whereof is, that when the finger is applied, the electric virtue all runs off upon the finger, as a non-electric body, and therefore cannot go to the pointed end to produce the flame, as it does when the finger is taken off.

Exp. VIII. If a musket-barrel be suspended, and the finger applied near it, as within $\frac{1}{4}$ of an inch, the fire will forcibly issue out, and strike it, and in striking it will give a very sensible snap; and several fingers being successively applied to the barrel, will cause several such eruptions and snappings of the fire, which will be all very sensible to the feeling, to the eye, and to the ear; and produce a most extraordinary and entertaining phænomenon.

Exp. IX. If a chain, or hempen-cord, be suspended by silken strings, all round the room, of any length you please, and one end thereof be hung by a loop across the barrel, the electrical fire will instantly be transmitted through the whole length of the chain, and appear upon every part at the approach of the finger, and be heard to snap, and strike with as great, if not greater, force, than from the gun-barrel itself. In this particular, the electric fire seems somewhat a-kin to that of lightning.

Exp. X. If a feather be suspended by an hempen or flaxen thread, or string, it will, when held near the barrel, be strongly attracted thereby, and adhere immoveably thereto; because all the electricity goes away, or runs off through the non-electric bodies, with which the said feather communicates. But the manner how the feather can be attracted by a virtue or power acting outwardly, and in contrary directions may seem somewhat strange, yet it is accounted for by the foregoing theory.

Exp. XI. The same feather, or any light body, suspended near the gun-barrel by a silken string, will be first attracted by it, and then soon afterwards repelled; and will continue to be so repelled till it has touched some other body. The reason of this is, that upon the contract with the barrel, the feather is impregnated with the electric virtue, which will not run off upon the silken string, as being an electric *per se*. Now, it is found to be the case of all attracting powers, that bodies equally possessed with them always repel each other, unless they are either in immediate contact, or very near it. But when the feather has touched some non-electric body, it loses its electricity, and again becomes capable of being attracted.

Exp. XII. If the silken string by which the feather is suspended be wetted throughout its length, it will become a non-electric body; and the feather, instead of being attracted and repelled, will now be only attracted. For all the electric virtue runs off by the moisture of the thread: by which it appears, that water, or any kind of moisture, is a non-electric substance, and so a conductor of electricity. Hence it is, that in a moist air, the feather in its repelled state will, by degrees, lose all its electricity among the aqueous particles, and will then again return to the electrified barrel, by attraction.

Exp. XIII. In like manner, a card, or tin-plate, being fitted into the end of the barrel, if any light bodies be laid thereon, as leaf-gold, silver, or brass, &c. they are immediately repelled, as if blown away with a blast of wind; nor will they come near the barrel or plate again, till they have first discharged their electricity on some non-electric bodies.—

Note,

Note, While the globe is whirling round, ſome perſon ſtanding by muſt lay his finger over the barrel, to prevent the electric virtue going to the light bodies till the appointed moment; when, upon taking off the finger, they all fly off at once.

Exp. XIV. If under the ſaid plate you hold another, with the ſame light bodies upon it, they will be attracted and repelled alternately between the two plates, in a very entertaining manner, and with a very great velocity, and for a conſiderable time. The reaſon why they are attracted a ſecond, third, &c. time, is becauſe each time they are repelled back to the lower plate, they loſe upon it all their virtue and ſo become again attractible.

Exp. XV. If a large plumy feather be ſuſpended horizontally at the end of a long chain, communicating with the barrel, and another ſet upright under it, on a cork, in a glaſs phial upon a pedeſtal; then when the finger (before laid on) is taken off the barrel, it is very pleaſant to ſee how the electricity coming among the plumulæ, or fibres of the ſuſpended feather, will cauſe them to extend and expand themſelves every way from the rib of the feather, at the ſame time they will attract the feather beneath, and cauſe its fibres to raiſe themſelves, and briſtle out in the ſame manner. Here it is obſervable, that all the plumulæ repel each other, and therefore ſtand at an equal diſtance nearly; and this they do, as being all poſſeſſed of the ſame virtue, which cannot go off, becauſe of the glaſs phial, which is an electric *per ſe*.

Exp. XVI. While the feathers are in their repellent ſtate, if any one lays his finger on the barrel, or any part of the chain, it is beautiful to ſee how how inſtantly the feathers are ſenſible of it, by letting their plumage all fall and drop into their natural ſtate. As alſo if he but ſlightly touches the barrel, or chain, the feathers ſuddenly catch, and ſhrink in, like the ſenſitive plant; and hence, by the way, ſome think the phænomena of that plant are owing to the repulſive power of electricity between the finger and its leaves.

Exp. XVII. If, while the feathers are electrified, a perſon approaches his finger near them, (eſpecially that which is ſuſpended) they will immediately point all their plumulæ towards the finger, and be ſtrongly attracted by it; and if the finger touches the feathers, they all ſeem eager to embrace it, and are ſtrongly attached thereto; if the hand be moved round about the ſuſpended feather, the feather will nimbly turn after it, and every where endeavour to lay hold on it; which, when it does, it loſes all its electricity, and again becomes non-electric.

Exp. XVIII. If to a gun-barrel you adapt a ſmall tin cup, and pour in water, then a perſon holding his finger perpendicular over the water, and within a quarter of an inch of its ſurface, or leſs, will find the water riſe up in form of a cone to meet his finger, and from the vertex or top thereof, a little ſtream of fire will iſſue to the finger, and ſnap againſt it as uſual, though not with ſo much force as from the ſides of the pot or the barrel itſelf. It is obſervable, that neither the water nor any other body will be in the leaſt ſenſibly heated by all the electric fire they are capable of receiving. Whence it appears, that this fire is not ſufficient to put the ſmall particles of bodies into ſuch a vibration or agitation, as to excite the leaſt ſenſation of warmth or heat.

Exp. XIX. If a ſponge, thorough dry, be hung on to the electrified barrel, it gives no appearance of fire, which ſhews it to be an electric ſubſtance: but if when the ſponge has been immerſed in water, it be ſuſpended to the barrel as before, and the finger or hand be applied near to it, the fire iſſues out with conſiderable force and ſnapping, and the drops which before the ſponge was electrified fell very ſlowly, will now fall very faſt; if the room be darkened, theſe drops will appear to be drops of fire, and illuminate the baſon into which they fall.

Exp. XX. If a capillary ſyphon be hung on to the ſmall cup of water above-mentioned, at the end of the barrel, and the finger laid acroſs the barrel to prevent the electric virtue going to the water; then before the water is electrified, you obſerve the ſyphon to drop only, and that very gently; but when the finger is taken off, and the water becomes electrified, the ſyphon runs a ſtream; and if the room be dark, it iſſues from the ſyphon in appearance of fire.

Exp. XXI. A perſon ſtanding on a cake of roſin, with his hand laid on the gun-barrel, if a vein be opened in his arm, then (if the electricity be ſtopped by the finger, as above) the blood will fly out to a certain diſtance; but when the finger is taken off, and the perſon by that means electrified, the blood will receive an impetus therefrom, and ſpin out with a much greater velocity, and to a much greater diſtance than before.

Exp. XXII. If a phial of water be provided, and well corked, and a wire bent on the top be pierced through the cork, and thruſt down near the bottom of the phial, leaving the upper part ſtanding about two or three inches above the bottle, then laying this wire on the globe in motion, the wire will receive the electricity from the globe, and the water will be impregnated therewith, the more as the wire is kept longer on the globe; then the perſon thus holding the phial in one hand, is to approach a finger of his other hand near the middle part of the globe, and he will receive the electric eruption of fire with a very conſiderable ſnap and force, greater by much than what proceeds from the barrel alone; the reaſon is, becauſe all the electricity running through the wire into the water, is there condenſed as it were, and confined by the

electric ſubſtance of glaſs, and ſo acts in a greater quantity, and therefore with a greater force, than when it iſſues from the barrel unconfined.

Exp. XXIII. In order to make this condenſation of the electric fire yet greater, the cork and top of the phial is to be cloſed every way very nicely with ſealing-wax; and then applied to the globe, as before, when the phial of water has been fully ſaturated with electricity, the ſurplus will immediately iſſue out in wonderful ſtreams of purple fire, through ſeveral pores it finds in the cork and wax; and very often many of theſe ſtreams will make a beautiful appearance in the room when darkened, and is a moſt ſingular phænomenon in nature.

Exp. XXIV. If inſtead of water we fill the phial with quickſilver, the ſnap and force will be ſomewhat greater, but nothing near in proportion as mercury is denſer than water; ſo that the force of electric percuſſion does not appear to depend upon the quantity of matter in the percutient phial, for if it did, the phial of mercury muſt give fourteen times a greater ſtroke (*cæteris paribus*) than the ſame ſized phial of water, which it does not do, and therefore ſome other principle of action ſeems latent in the ſubſtance of bodies.

Exp. XXV. While the phial of mercury is electrifying on the globe, the electric ſtreams will iſſue out of the ſealing-wax more copiouſly than from the phial of water, and will of themſelves ſnap; and theſe flaſhings and ſnappings ſucceed each other ſometimes very faſt, and repreſent, as it were in miniature, an artificial thundering and lightening; and their phænomenon is peculiar to the mercurial phial, the phial of water never ſnapping of itſelf that I have yet obſerved.

Exp. XXVI. If either the phial of water or mercury, when electrified on the globe, be hung on the gun-barrel, the hand ſtill holding it faſt, then a finger of the other hand applied near the barrel, will draw off a ſpark that will give a very ſenſible ſnap and ſtroke, which will be felt in one or both the arms, and alſo acroſs the breaſt; and it is very remarkable, that this ſenſation is rather an uneaſy than a painful one, and goes no farther than the elbows, in general.

Exp. XXVII. If the electrical virtue be ſufficiently condenſed in the phial, by holding the wire long on the globe, then the room being made dark, and the phial held up with the hand, the electric fire will be ſeen to go off from the point of the wire in a ſmall white flame, which will continue ſome time; and if a finger be applied near it, the wire will emit it with a ſnap, but not ſo forcibly as when held on the globe. And this is the only way, perhaps, of retaining the electric fire, or making its action temporary. And the letter from Paris ſays, it has been thus retained in the froſt for thirty-ſix hours together. But I cannot produce any permanency of its efficacy like that.

Exp. XXVIII. A perſon ſtanding on a cake of roſin, at leaſt three inches thick, laying one hand on the gun-barrel, will be electrified, that is, he will be all over poſſeſſed with the electric virtue, and at the ſame time feel nothing of it, unleſs ſome perſon ſtanding by put his finger near to any part, and then the virtue will be emitted in form of fire from any part, and ſnap, and become very ſenſible to both the parties, but in a very innocent manner.

Exp. XXIX. If the perſon electrified holds in his hand a ſword, or any pointed poliſhed piece of iron, and the room be darkened, a continual flame iſſues out of the point every way, like that deſcribed in Exp. V. and VI.

Exp. XXX. If the electrified perſon holds a ſmall cup of water in one hand as he ſtands on the roſin, and with the other takes hold of the wire in the electrified phial, and then the perſon who holds the phial, by approaching his finger near the ſurface of the water, will cauſe it to emit the fire with a more ſenſible ſhap and force, than can be excited without it.

Exp. XXXI. If the perſon ſtanding on the roſin holds a piece of money between his teeth, and the wire of the electrified phial with one hand; then if the perſon who holds the phial touches the money, the ſhock will be very ſenſibly felt in the teeth and head of the electrified perſon who holds it, and alſo to the other who touches it.

Exp. XXXII. Let a perſon ſtand on one cake of roſin, and lay one hand on the barrel; and let another perſon ſtand on another cake by him, and then when the firſt perſon is thoroughly electrified, let them both incline their heads and ſalute each other, and the fire will join their lips when nearly touching, and give them a ſmart and mutual rebuff, which will make them ſeparate more haſtily than they joined: but yet the pungency is not ſo great as to be very diſagreeable.

Exp. XXXIII. A wire fixed on a pedeſtal, and placed upright in a baſon of water, is to be electrified from the phial above-mentioned, and then the perſon holding the phial is to touch the ſurface of the water in the baſon with the other hand; the fire here has a conſiderable effect, but not ſo great as the letter from Paris ſeems to intimate at, leaſt I could never find it ſo.

Exp. XXXIV. The phial being electrified, as above, the whole company join hands, or communicate with each other by wires, then the operator, or perſon who ſtands firſt, at one extremity of the line, hangs the electrified phial on the barrel, when the perſon at the other extremity draws off the ſpark from the barrel; and at that inſtant all the company receive the ſhock, which they feel to their elbows, and in both their arms. But I could never yet find thoſe ſhocks ſo violent and dangerous as they have been repreſented, though they are nearly as great as any perſon (eſpecially the men) care to endure.

endure. This experiment will equally ſucceed, be the company ever ſo large.

Exp. XXXV. A perſon ſtanding on roſin, with one hand on the barrel, points the finger of the other to the warm ſpirits of wine, and by communicating the electric fire thereto, kindles the riſing fume, and ſo ſets the whole on fire. In this manner, any ſort of matter, which, when warmed, will ſend forth an inflammable vapour, may be thus ſet on fire.

Exp. XXXVI. Another way to ſet fire to the ſpirit is this; the perſon holds the phial of mercury, or water, when electrified, on the barrel with one hand, and the warm ſpirit being put into a cup or ſpoon adapted to the barrel, and thereby ſtrongly electrified, a finger of the other hand being held over and near the ſpirit, draws the electric ſpark out of it, and with a ſnap ſets the vapour in a flame, and conſequently all the ſpirit.

Exp. XXXVII. Becauſe gunpowder, when heated, emits no inflammable ſtream, it cannot be fired by itſelf; but if you mix with it a little inflammable vegetable oil of any ſort, and grind them together, and then put a ſmall quantity into a ſpoon and heat it, the vapour will be fired in each of the two ways above-mentioned for firing the ſpirit, and will ſet fire to the oil and powder nearly at the ſame time, and the powder will be exploded in the ſame manner it uſually is when wetted. But it may be fired dry, by mixing it with camphor, and reducing both to a powder, for this will ſend forth an inflammable vapour, which will be kindled when heated, in either of the methods above deſcribed.

Exp. XXXVIII. If a plate of tin be adapted to the end of the barrel, and another be held about two inches under it with a ſquare or long piece of leaf gold, braſs, &c. then while the barrel is electrified, the ſaid piece of gold will be ſwiftly at firſt attracted and repelled between the two plates, till at laſt the action between each becoming equal, the leaf gold will be ſo equally affected by either, that all its variable motion will be deſtroyed, and it will appear to be ſuſpended at reſt between both, and afford a moſt ſurpriſing and agreeable ſpectacle.

Exp. XXXIX. If a ſmall bell of a clock be fixed to the end of the gun-barrel, and another at four inches diſtance on a pedeſtal of wood at the ſame height, and then a ſmall ivory ball be ſuſpended by ſilken ſtrings in the middle between both; the barrel when electrified will electrify the firſt bell, and that will attract the ivory ball; as it hangs by ſilk, which is itſelf electrical, it will retain all the electric virtue it receives from the bell, and therefore will be repelled from it, and thus be made to ſtrike againſt the other bell; on this it will diſcharge all its electricity by contact, and ſo become again a non-electric, and in that caſe will be again attracted by the firſt bell. And this effect will be produced alternately, ſo long as the globe is in motion; the conſequence of which is, that the ivory ball will be put into conſtant vibration, and make an electrical pendulum, which, as it ſtrikes each bell, it makes them ring, and produce one of the moſt agreeable effects both to the eye and ear.

Exp. XL. If a ſmall plate be held under that adapted to the gun-barrel, and light bodies laid upon it, and then a fine piece of muſlin or lawn be interpoſed between both; the electrified barrel will not affect the light bodies, but they will remain abſolutely at reſt. For the electric virtue will run off upon the muſlin, and its ſupporter, as being non-electric bodies; and ſo will not come near the light bodies to put them in motion.

Exp. XLI. If a loadſtone, armed with iron, be hung on to the gun-barrel by an iron wire, the electric virtue will ruſh out from every part, but more forcibly from the iron than from the ſtone itſelf; from the ſtone it ſeems to be emitted in a more lax manner, and diffuſed in a ſort of ſteam or fiery vapour; whereas from the iron it iſſues in a more impetuous, denſe, and penetrating ſtream. By this experiment we ſee the two moſt conſiderable powers of nature, electricity and magnetiſm, do no way interfere, or impede each other's action.

Exp. XLII. If the globe be exhauſted of all its air, and then whirled about on the machine, the electricity will be obſerved to act wholly within the globe, where it will appear (in a darkened room) in form of a cloud or flame of reddiſh or purple coloured light, filling the whole capacity of the globe. This voluble flame will be diminiſhed, and diſappear by degrees as the air is gradually admitted into the globe. The reaſon why the action of the electric virtue does not ſhew itſelf outwardly, is the ſtrong repulſive power of the electric particles of air encompaſſing the globe, confining the electric effluvium, and cauſing it to tend inwards, where it meets with no reſiſtance in the vacuous ſphere.

In plates XLVI. and XLVII. there is given a view of ſeveral electrical machines, which have been invented by different perſons who have been curious in trying electrical experiments.

ELECTROMETER, an inſtrument contrived to meaſure the force of electricity.

This inſtrument was contrived about the year 1748 by M. Le Roy and M. D'Arcy, and is made in the following manner.

In Plate XLVII. *fig.* 1. A B is a large veſſel containing a glaſs bottle C D, called the philoſophical egg: at the extremity of the neck of this bottle is fitted on the root V, perfectly cylindrical, one line in diameter, and twelve inches long. The veſſel A B is covered again at the top with a plate of braſs H, which fits cloſe upon it; this plate has a large perforation at its center, and ſo has the veſſel, that the rod may paſs through at liberty. At the upper extremity of the rod, is the ſmall circular plate of braſs L, fourteen lines $\frac{1}{2}$ diameter. The veſſel A B

being

being full of water, the egg is immerſed to a certain depth, which ought to be ſuch that, the inſtrument being at reſt, that is, not electrified, the lower extremity of the egg may be, as near as poſſible, to the bottom of the veſſel without touching it. That the egg and rod may always be in a vertical ſituation, the egg is ballaſted with mercury, by which means the center of gravity being very low, the whole keeps itſelf perpendicular to the horizon, and proves by the leaſt poſſible motion of the egg, from its balance, that, if it were not confined, it would go towards the ſide of the veſſels, and ſwim ſometimes on one ſide, and ſometimes on the other; wherefore it was neceſſary to determine it to a center, in the following manner: on the plate H are fixed five ſilver wires in the form of a croſs, like thoſe in micrometers; this croſs is formed by double wires which have a ſmall ſquare ſpace in the center of the plate, which, being larger than the diameter of the rod, permits it to aſcend and deſcend between the wires without any ſenſible friction, and yet reſtrains it from erring from its center: and this ſingular phænomenon ariſes, when the whole machine is ſtrongly electrified; the rod keeps in the middle of the wires, and almoſt without touching them, becauſe, being electrified, as well as they are, it avoids them continually.

After this deſcription of the inſtrument, it is eaſy to conceive its uſe, eſpecially if we attend to this known principle in hydroſtatics, that a body immerſed in water ſwims on the ſurface, or ſinks in it, in proportion as a volume of water, like that it poſſeſſes, is lighter or heavier than the body itſelf; from this principle it follows, that a volume of water equal to that of the egg, and that part of the rod immerſed in the water, when the whole is at reſt, was equal to the egg, the little plate, and all the rod: conſequently, if the whole be elevated one inch, the power which will ſuſtain it at this height, will ſuſtain a weight equal to a volume of water of the thickneſs of the rod and an inch above; becauſe the volume of water which the egg and rod then poſſeſſes is leſſened by this quantity. If, therefore, different powers ſuſpend it at 1, 2, 3, 4 inches, *&c.* in height above the point of reſt, theſe powers will be, with regard to each other, as theſe numbers, double, trible, quadruple, *&c.* you will ſee, in a moment, that electricity produces the ſame effect upon the electrometer, that is, it performs the function of a power which would ſuſpend it at 1, 2, 3, 4 inches, *&c.* above its point of reſt, and conſequently, that by means of this inſtrument, we may eſtimate all its different degrees of force; let us ſuppoſe, for example, the whole machine compoſed of the veſſel A B, the egg, *&c.* placed like that in O, (*fig.* 2.) on a recipient of glaſs, or any other electric *per ſe*. Electrify the veſſel A B, the rod V and plate L will become electrified alſo. Now, it is admitted, that all electrical bodies repel each other; thus the little plate L and the rod V, being repelled by the great plate H, will neceſſarily riſe more or leſs in proportion to the ſtrength or weakneſs of the electricity. Electricity therefore will, as I have ſaid before, perform the function of a power, that will ſuſpend the inſtrument to a certain elevation; but, as theſe powers are proportional to the elevations of the inſtrument above its equilibrium, or point of reſt, theſe elevations alſo will be in proportion to the different degrees of the force of electricity: this is therefore a true electrometer. But this inſtrument is of much more extenſive uſe than barely this; for it may be employed in a great number of electrical experiments, to determine the laws of attraction, repulſion, tranſmiſſion, *&c.* in electrical bodies; diſcoveries equally important with that of menſurating the electrical force.

Method of uſing the electrometer.—As electrical bodies have this inconvenience, that they cannot be approached, without deſtroying their electricity, it is evident, that, if we come ſo near the electrometer as to judge of its motions with exactneſs, we ſhould deſtroy its electricity. This reaſon determined us, after a number of attempts, to make our obſervations in the following manner: we placed a great lantern, with a large wax candle, in a part of the room, which projects its light through a hole on the electrometers I K (we have not drawn the lantern in the plate, for fear it might have cauſed ſome confuſion, and have, therefore, only exhibited the ſtream of light); behind theſe electrometers is a very ſolid frame Q; all the part X is wood, but it may be of any opake matter. In this frame are cut two rectangles, or windows, filled with glaſſes, on which are marked very exact diviſions in ſtrong Indian ink.

This frame is ſo diſpoſed, that the projection of the electrometers may fall upon the glaſſes, and the extremity of the rod D, being made in the form of a cone, projects a very nice ſhadow. Now, as theſe glaſſes are tranſparent, the obſerver, placed behind in F, ſees, in the moſt diſtinct manner, all the different elevations of the electrometer, and can therefore judge of all its variations with the utmoſt exactneſs; for, the plane of the ſquare being perpendicular to the horizon, and the electrometer riſing and falling in a parallel plane, the elevations and depreſſions of the ſhadows are always correſpondent to thoſe of the electrometers. The chains M ſerve to conduct the electricity from the bar of iron, or any other electrified body, to the electrometer; the ſquare Q, inſtead of two windows, may have but one, that being ſufficient for the electrometer. But we muſt, at the ſame time, make our obſervations on the inſtrument with which we made the experiments, and the electrometer too, to be aſſured that the electricity is always equal; which cannot be done without comparing their ſhadows very cloſely. The conſtruction of the electrometer

ſhews

shews it has all the essentials to an instrument of this kind.

1st, As the electrical force is very weak, the instrument must be very nice, and sensible of the least impression; therefore the weight of eight grains, laid on the little plate, makes it sink above four inches.

2dly, As the electrical force is very subject to alterations, the instrument must be so contrived as to exhibit all its variations; a thousand experiments have convinced us, that the least alteration in the force of electricity immediately affects the electrometer. It is, in short, universal, for the true electrometer is the cylindrical rod V, which determines the quantity of electrical power by the number of its parts raised above the point of rest. Now it is not difficult to procure a cylindrical rod of a line diameter. It is true, the diameter of the little plate L, and its distance to H, the point of rest, may cause some differences in the repulsions; but it is easy to observe all these proportions; so that any one may construct an electrometer, which will be operated upon, like ours, by the same power of electricity. This property seems, to me, one of the most remarkable in our instrument, like that of M. Reaumer's thermometer, which all Europe has admired. As I have said our electrometer might be used as an instrument, it may be proper to give some account of the experiments we have made. In order to discover whether electricity is in proportion to the bulk or surface of bodies, we applied ourselves in the manner following: The instrument E served for an electrometer, the other, I, was designed to make the experiment on. Above this last was suspended perpendicularly, at the distance of ten inches, a cap or portion of the sphere PS; this cap was of hammered iron, very thin and of a very regular figure; it received its electricity from the electrical bar by a brass wire, and, being suspended on silk, preserved it. The chain in *fig.* 2, which has a communication with both instruments; in this experiment but with the electrometer; so that the instrument was not electrified. One person made his observation on the square of the height of the electrometer caused by the electricity; another observed the elevation of the instrument; and several repeated experiments confirmed us in the opinion, that the elevation of the instrument was in proportion to the force of the electricity; and this we found to answer exactly, after having repeated the experiment above fifty times. We afterwards poured mercury into this cap, till it increased the weight sixty-fold, and found no sensible alteration in the experiment. This seems to shew, that the attraction of electrical bodies is in proportion to their surfaces; but this is a matter of doubt, for the fire and sparks drawn from an electrical body may follow some other law. Certain it is, that a piece of any metal must be of a certain thickness to extract shining sparks from it, otherwise you can only procure such a kind of fire as is extracted from electrified wood of any thickness; yet, if we extract sparks from the middle of a plate of iron, they are very strong, and those extracted from the cap, whether with or without mercury, seemed to have no difference. We have, in short, found, by a multitude of experiments, that the ponderosity or lightness of a body neither increases nor diminishes its electricity.

ELECTRUM, amber, in natural history. See the article AMBER.

ELECTUARY, in pharmacy, a form in which both officinal and extemporaneous medicines are frequently made. It may be considered as a number of boluses united together, but made a little softer by the addition of a due proportion of syrups, &c.

ELEGANCE, or ELEGANCY, an ornament of politeness and agreeableness, shewn in any discourse, with such a choice of rich and happy expressions, as to rise politely above the common manners, so as to strike people of a delicate taste, and diffuse a relish which affects every body.

It is observed that elegance, though irregular, is preferable to regularity without elegance: that is, by being too scrupulous of grammatical construction, we lose certain licenses wherein the elegance of language consists.

ELEGANCE, in painting, a certain manner which embellishes and heightens objects, either as to their form, colour, or both, without destroying or perverting the truth. It is not seen in the correctness of the design, as appears from Raphael, and the antique. It is most sensibly perceived in works otherwise careless and inaccurate, as in Corregio, where, notwithstanding all the defects as to justness of design, there is an elegance even in the manner of the design itself, as well as in the turn of the attitudes, &c.

ELEGIT, in law, a writ of execution, which lies for a person who has recovered debt or damages; or upon a recognizance in any court, against a defendant that is not able to satisfy the same in his goods.

ELEGY, in poetry, primarily and generally implies a mournful poem.

The word is derived, according to Didymus, from ε, a particle of grief, and λεγω, to say, and according to others from ελεον, something moving, and λεγω.

As elegy, at its first institution, was intended for tears, it expressed no other sentiments, it breathed no other accents, but those of sorrow. With the negligence natural to affliction, it sought less to please than to move. By degrees, however, elegy degenerated from its original intention, and was employed upon all sorts of subjects, gay or sad, and especially upon love.

Ovid's books of love, the poems of Tibullus and

Propertius, are intitled elegies; and yet so far are they from being sad, that they are sometimes scarce serious: so that one and the same title was indiscriminately given to poems on different subjects, but which agreed in their verse and manner of writing. The chief subject then to which elegy owes its rise, are death and love: so that elegy ought to be esteemed the most perfect, which has somewhat of both at once; namely, where the poet bewails the loss of some youth, or damsel, falling a martyr to love. The next are those elegies full of that melancholy complaint which lovers seldom want matter for: the thoughts of elegy should be always natural, far from the affectation of wit: its sentiments tender and delicate; its expression simple and easy, always retaining that alternate inequality of measure which Ovid extols so much; and which gives the elegiac poetry of the ancients so much the advantage over the moderns. Elegy should flow in one even current, smooth, humble, and unaffected; and yet she is not abject in her humility, but becoming, elegant, and attractive.

Some early writers in this way, among the Greeks, were Callimachus, Philetas, Mimnermus, Callinus, and others, of whose writings only fragments have been saved. Quintilian gives the preference to Callimachus; but Horace ranks Mimnermus above him. Mimnermus is by some reckoned the inventor of elegiac verse; he at least gave it its perfection, and was perhaps the first who transferred it from funerals to love.

Among the Latins, Ovid, Tibullus, and Propertius, bear the first rank: there is scarce any thing of Catullus's elegiac, except the measure of some of his verses; and those so rough, that they cannot be read without great offence to the ear. Ovid is generally reckoned the first among the elegiac writers; yet Tibullus is less diffuse and more correct. Ovid's perpetual repetition of *mei*, *tui*, and *sui*, in the last foot of his pentameters, is unpardonable. Tibullus and Propertius rarely fall into this fault, but into another, especially the latter, from which Ovid is free; and that is, concluding the pentameter with words of three or four syllables; whereas harmony requires a word of no more than two.

Among the ancients, hexameters and pentameters were so peculiar to elegy, that this kind of metre is usually styled elegiac. Instead of it, we, in our tongue, use the word heroic.

Among our modern poems, we have only some elegies on funeral occasions; but we have many that may be called so in the larger sense of the word, as used by the ancients; many very ingenious ones on love; and others of a melancholy and soft turn.

ELEMENT, in physiology, a term used by philosophers to denote the original component parts of bodies, or those into which they are ultimately resolvable.

The elements of Aristotle were four, earth, water, air, and fire. See ARISTOTELIAN *Philosophy*.

The Cartesians admit only three elements, the first a materia subtilis, or fine dust; the second, a coarser, but round kind; and the third, a still more irregular and hooked kind of particles. See the article CARTESIAN *Philosophy*.

Concerning the true elements of nature, the incomparable Sir Isaac Newton thus explains himself in his optics: "It seems probable to me, that God in the beginning formed matter in solid, massy, hard, impenetrable, moveable particles, of such signs and figures, and with such other properties, and in such proportion to space, as most conduced to the end for which he formed them; and that these particles, being solid, are incomparably harder than any porous bodies compounded of them; even so very hard, as never to wear or break in pieces, no ordinary power being able to divide what God himself made one in the first creation. While the particles continue entire, they may compose bodies of one and the same nature and texture in all ages: but, should they wear away, or break in pieces, the nature of things depending on them would be changed. Water and earth composed of old worn particles, and fragments of particles, would not be of the same nature and texture, now, with water and earth composed of entire particles in the beginning: and therefore, that nature may be lasting, the changes of corporeal things are to be placed only in the various separations and new associations and motions of these permanent particles; compounded bodies being apt to break, not in the midst of solid particles, but where those particles are laid together, and only touch in a few points."

The chemical elements or principles to which all bodies may be ultimately reduced, are these five: 1. Water, or phlegm, which, in the chemical analysis of them, rises first in form of vapour. 2. Air, which escapes unseen in great quantities from all bodies, so as to constitute half the substance of some of them. 3. Oil, which rises after, and appears swimming on, the surface of the water. 4. Salt, which is either volatile, or rises in the still, as that of animal substances; or fixed, as that of vegetables, which is obtained by reducing them to ashes, making a lixivium or ley of these, and afterwards evaporating the moisture; by which means the common salt shoots into crystals. 5. Earth, or what is called *caput mortuum*, being what remains of the ashes after the salt is extracted. This is the last element of all bodies, which can be no farther altered by any art whatsoever. See WATER, AIR, &c.

ELEMENT, in a figurative sense, is used for the principles and foundations of any art or science, as Euclid's Elements, &c.

ELEMI, or ELEMY, is a resin of Asiatic origin: the plant which produces it is not yet known with certainty. There is also an inferior kind, brought from America, which is the only one now to be met with in the shops: the parent of this sort is called

called by Ray, *Arbor Brazilienſis gummi elemi ſimile fundens, &c.* a Brazilian tree, yielding a gum like elemi, with winged leaves, verticillate flowers, and a fruit about the ſize and ſhape of an olive.

The true elemi comes over in large oblong maſſes or round leaves, generally wrapt up in leaves of the Indian reed. It is of a yellowiſh or rather greeniſh white colour, ſemitranſparent; of a ſoft conſiſtence, betwixt that of wax and turpentine, or dry on the outſide and ſoftiſh within: by age, it grows hard and brittle throughout. It has a moderately ſtrong, not unpleaſant ſmell, reſembling that of a mixture of fennel, daucus, and ſmallage-ſeeds. It is commonly full of impurities, which are obvious enough to the eye.

This reſin has hitherto been employed only in external applications; in nervine, vulnerary, and digeſtive plaſters and balſams. In making theſe kinds of compoſitions, we muſt be careful to avoid too great a degree of heat in mixing the ingredients; leſt the eſſential oil, the moſt uſeful part of the elemi, be loſt.

ELENCHUS, in logic, a ſophiſm, or fallacious argument, which deceives the hearer under the appearance of truth. See the article SOPHISM.

ELEOSACCHARUM, or ELÆOSACCHARUM. See the article ELÆOSACCHARUM.

ELEPHANT, *Elephas*, in zoology, a genus of quadrupeds, of the order of the jumenta, the characters of which, according to Linnæus, are theſe: it has no fore-teeth, the upper canine, or dog teeth, are conſiderable long, it has a very long flexible proboſcis or trunk, and two paps placed on the breaſt.

The teeth of this animal is what we call ivory. See IVORY.

The elephant, of which there is only one known ſpecies, is, when full grown, from ſeventeen to twenty feet high; and its body is withal ſo enormouſly bulky, that the belly reaches nearer the ground than could eaſily be conceived of a creature of its height. The trunk is, properly ſpeaking, nothing but the noſe continued to a great length; its ſubſtance is fleſhy, but firm, being compoſed of three ſeries or orders of fibres: this trunk the creature can contract or protrude forward with great violence, from the length of one foot to five or more.

Knights of the ELEPHANT, an order of knighthood in Denmark, conferred upon none but perſons of the firſt quality and merit. It is alſo called the order of St. Mary. Its inſtitution is ſaid to have been owing to a gentleman among the Daniſh croiſees having killed an elephant, in an expedition againſt the Saracens, in 1184, in memory of which king Canutus inſtituted this order, the badge of which is a towered elephant, with an image of the Holy Virgin encircled with rays, and hung on a watered ſky-coloured ribbon, like the George in England.

ELEPHANTIASIS, or ELEPHAS, in medicine, is a ſpecies of leproſy, ſo called, becauſe it effects the legs in ſuch a manner, as to make them appear like thoſe of an elephant. See LEPROSY.

The word is derived from the Greek, ελεφας, an elephant.

ELEPHANTOPUS, in botony, a genus of plants, whoſe flower is compound and tubuloſe, and conſiſts of four or five hermaphrodite ligulated corollulæ, each having a narrow border divided into five parts; the ſtamina are five very ſhort capillary filaments, top'd with tubuloſe cylindrical atheræ; the ſeeds are ſolitary, and contained in the cup of a compreſſed figure, and crowned with briſtly hairs.

ELEVATION, *Elevatio*, the ſame with altitude or height. See ALTITUDE.

Angle of ELEVATION, in gunnery, that comprehended between the horizon and the line of direction of a canon or mortar; or it is that which the chaſe of a piece, or the axis of its hollow cylender, makes with the plane of the horizon.

ELEVATION, in architecture, the ſame with an orthographic, or upright draught of a building. See ORTHOGRAPHY.

ELEVATION *of the Hoſt*, in the church of Rome, that part of the maſs where the prieſt raiſes the hoſt above his head for the people to adore.

ELEVATOR, in anatomy, the name of ſeveral muſcles, ſo called from their ſerving to raiſe the parts of the body to which they belong; ſuch are the elevator alæ naſæ, the elevator of the auricle or external ear, the elevator of the epiglotis, of the eye-lids, humerus, lips, urethra, and thoſe of the anus, called alſo levatores. See MUSCLE.

The elevator of the eye-lids is alſo called ſuperbus, as being uſed when people put on a haughty high look.

ELEVATOR, in ſurgery, an inſtrument to elevate or raiſe bones, as in fractures of the ſkull, &c.

ELEVE, a French term, ſometimes met with in the Engliſh language, ſignifying a diſciple or ſcholar.

ELEUSINIA, in Grecian antiquity, a feſtival kept in honour of Ceres, every fourth, by ſome ſtates, but by others, every fifth year. The Athenians celebrated it at Eleuſis, a town of Attica, whence the name.

ELEUTHERIA, another feſtival celebrated at Platæa, by delegates from almoſt all the cities of Greece, in honour of Jupiter Eleutherius, or the aſſertor of liberty.

ELIQUATION, in metallurgy, a ſeparation of the different parts of mixed bodies, by the different degrees of fire required to melt them.

ELIRE, or CONGE D'ELIRE. See the article CONGE.

ELISIUM, or ELYSIUM. See ELYSIUM.

ELISION, in grammar, the cutting off or ſuppreſſing a vowel at the end of a word, for the ſake

of

of found, or measure, the next word beginning with a vowel.

Elisions are pretty frequently met with in English poetry, but more frequently in Latin, French, &c. They chiefly consist in suppressions of the *a*, *e*, and *i*, though an elision suppresses any of the other vowels: in the following example from Virgil there are three elisions.

Phillida amo ante alias. ——

ELIXATION, in pharmacy, the extracting the virtues of ingredients by boiling or stewing. See DECOCTION.

ELIXIR, a compound tincture extracted from many efficacious ingredients. Hence the difference between a tincture and an elixir seems to consist in this, that a tincture is drawn from the ingredients, sometimes, with an addition of another to open it, and dispose it to yield to the menstruum; whereas an elixir is a tincture extracted from several ingredients at the same time.

The word is Arabic, *al-ecsir*, or *al-eksir*, and implies an artificial extraction of some essence.

ELK, *Alce*, in zoology, an animal of the deer-kind, with the horns palmated, and without a stem. It is a native of the northern parts of Europe; and is a very large and strong animal, being equal in size to a horse, but much less beautiful.

Elks hoofs stand recommended for the cure of the epilepsy; but at present are only used as an ingredient in some old compositions.

ELL, *Ulna*, a measure of length different in different countries; but those mostly used in England, are the English and Flemish ells: the former of which is three feet nine inches, or one yard and a quarter, and the latter only twenty-seven inches, or three quarters of a yard. In Scotland, the ell contains $37\frac{2}{10}$ English inches. See the article MEASURE.

ELLIPSIS, in geometry, a curve line returning into itself, and produced from the section of a cone by a plane cutting both its sides, but not parallel to the base. See CONIC SECTIONS.

The easiest way of describing this curve, in plano, when the transverse and conjugate axes A B, E D, (Plate XLVIII. *fig.* 1.) are given, is thus: First take the points F, *f*, in the transverse axis A B, so that the distances, C F, C *f*, from the center C, be each equal to $\sqrt{AC - CD}$; or, that the lines F D, *f* D, be equal to A C. Then, having fixed two pins in the points F, *f*, which are called the foci of the ellipsis, take a thread equal in length to the transverse axis A B; and fastening its two ends, one to the pin F, and the other to *f*, with another pin M stretch the thread tight: then if this pin M be moved round till it returns to the place from whence it first set out, keeping the thread always extended so as to form the triangle F M *f*, it will describe an ellipsis, whose axes are A B, D E.

The greater axis, A B, passing through the two foci F *f*, is called the transverse axis; and the lesser one D E, is called the conjugate, or second axis: these two always bisect each other at right angles, and the center of the ellipsis is the point C, where they intersect. Any right line passing through the center, and terminated by the curve of the ellipsis on each side, is called a diameter; and two diameters, which naturally bisect all the parallels to each other, bounded by the ellipsis, are called conjugate diameters. Any right line, not passing through the center, but terminated by the ellipsis, and bisected by a diameter, is called the ordinate, or ordinate applicate, to that diameter. And a third proportional to two conjugate diameters, is called the latus rectum, or parameter of that diameter which is the first of the three proportionals.

The reason of the name is this: let B A, E D, be any two conjugate diameters of an ellipsis (*fig.* 2. where they are the two axes) at the end A, of the diameter A B, raise the perpendicular A F, equal to the latus rectum, or parameter, being a third proportional to A B, E D, and draw the right-line B F: then if any point P be taken in B A, and an ordinate P M be drawn, cutting B F in N, the rectangle under the abscisS A P, and the line P N will be equal to the square of the ordinate P M. Hence drawing N O parallel to A B, it appears that this rectangle, or the square of the ordinate, is less than that under the abscisS A P, and the parameter A F, by the rectangle under A P and O F, or N O and O F; on account of which deficiency, Apollonius first gave this curve the name of an ellipsis, from ελλειπειν, to be deficient.

In every ellipsis, as A E B D (*fig.* 2.) the squares of the semi-ordinates M P, *m p*, are as the rectangles under the segments of the transverse axis A P × P B, A *p* × *p* B, made by these ordinates respectively; which holds equally true of the circle, where the figures of the ordinates are equal to such rectangles, as being mean proportionals between the segments of the diameter. In the same manner, the ordinates to any diameter whatever, are as the rectangles under the segments of that diameter.

As to the other principal properties of the ellipsis, they may be reduced to the following propositions: 1. If from any point M in an ellipsis, two right lines, M F, M *f*, (*fig.* 1.) be drawn to the foci F, *f*, the sum of these two lines will be equal to the transverse axis A B. This is evident from the manner of describing an ellipsis. 2. The square of half the lesser axis is equal to the rectangle under the segments of the greater axis, contained between the foci and its vertices; that is, $DC^2 = AF \times FB = Af + fB$. 3. Every diameter is bisected in the center C. 4. The transverse axis is the greatest, and the conjugate axis the least, of all diameters. 5. Two diameters, one of which is parallel to the tangent in the vertex of the other, are conjugate diameters;

ameters; and *vice versa*, a right line drawn through the vertex of any diameter parallel to its conjugate diameter, touches the ellipsis in that vertex. 6. If four tangents be drawn through the vertices of two conjugate diameters, the parallelogram contained under them will be equal to the parallelogram contained under tangents drawn through the vertices of any other two conjugate diameters. 7. If a right line, touching an ellipsis, meet two conjugate diameters produced, the rectangle under the segments of the tangent, between the point of contact and these diameters, will be equal to the square of the semi-diameter, which is conjugate to that passing through the point of contact. 8. In every ellipsis, the sum of the squares of any two conjugate diameters, is equal to the sum of the squares of the two axes. 9. In every ellipsis, the angles FGI, *f*GH, (*ibid.* n° 1.) made by the tangent HI, and the lines FG, *f*G, drawn from the foci to the point of contact, are equal to each other. 10. The area of an ellipsis is to the area of a circumscribed circle, as the lesser axis is to the greater; and *vice versa*, with respect to an inscribed circle; so that it is a mean proportional between two circles, having the transverse and conjugate axes for their diameters. This holds equally true of all the other corresponding parts belonging to an ellipsis.

The curve of any ellipsis may be obtained by the following series: Suppose the semi-transverse axis CB$=r$, the semi-conjugate axis CD$=c$, and the semi-ordinate $=a$; then the length of the curve MB$=a+\frac{r^2 a^3}{6 c^4}+\frac{4 r^2 c^2 a^5-r a^5}{40 c^8}+\frac{8 c^4 r^2 a^7+r^6 a^7}{112 c^{12}}-\frac{4 c^2 r^5 a^7}{\quad}$, &c. And, if the species of the ellipsis be determined, this series will be more simple: for if $c=2r$, then MB$=a+\frac{a^3}{96 r^2}+\frac{3 a^5}{2048 r^4}+\frac{113 a^7}{458752 r^6}+\frac{2419 a^9}{75497472 r^8}$, &c. This series will serve for an hyperbola, by making the even parts of all the terms affirmative, and the third, fifth, seventh, &c. terms negative.

The periphery of an ellipsis, according to Mr. Simpson, is to that of a circle, whose diameter is equal to the transverse axis of the ellipsis, as $1-\frac{d}{2.2}-\frac{2 d^2}{2.2.4.4}-\frac{3.3.5 d^3}{2.2.4.4.6.6}-\frac{2.3.5.5.7 d^4}{2.2.4.4.6.6.8.8}$, &c. is to 1, where d is equal to the difference of the squares of the axis applied to the square of the transverse axis.

Those who desire to be more particularly informed concerning the properties of the ellipsis, may consult Simpson's Conic Sections, and Wolfius's Elements of Mathematics, tom. 1. also Maclaurin's Fluxions, art. 609. seq. and the marquis de l'Hospital's Sect. Conic. lib. 6.

ELLIPSIS, in grammar and rhetoric, is a figurative way of speaking, by which some word in a discourse is retrenched, or omitted, when some violent passion will not let a person utter what he thinks.

ELLIPTIC, or ELLIPTICAL, something belonging to an ellipsis. See ELLIPSIS.

ELLIPTICAL ARCH, a part or segment of the curve of an ellipsis.

Elliptical arches are frequently preferred to those that are circular, in various kinds of buildings, because their span may be equal to those of the circle, without rising to so great a height; and this is the reason why they have been preferred in bridges: but it must be remembered, that they will decrease in strength, in proportion as they deviate from the circle. See the article BRIDGE.

ELLIPTOIDES, in geometry, a name used by some to denote infinite ellipses, defined by the equation $a y^{m+n}=b x^m$ $(a-x^n)$.

There are several species of elliptoides; as for instance, if $ay^3=bx^2$ $(a-x)$ it is a cubical elliptoid; and if $ay^3=bx^2$ $(a-x^2)$ it denotes a biquadratic elliptoid, which is an ellipsis of the third order, with respect to the Apollonian ellipsis.

ELM, *Ulmus*, in botany, a genus of trees, whose flower is destitute of a corolla; but consists of a monophyllous, rough, turbinated cup, cut at the limb into five parts, coloured within, erect, and persistent. The stamina are five subulated filaments, double the length of the calyx, topped with short erect antheræ, having four furrows.

The fruit is a roundish, compressed, membranaceous drupe, including a seed of the same shape.

The flowers of the common elm comes out in March upon the slender twigs of the tree before the leaves, and stand in clusters. The root is thick, hard, and woody, and sends forth a number of fibres which spread to a great distance. The trunk or body, when old, is of a dark colour, and full of longitudinal wrinkles; but the young branches are smooth and tough. The leaves are wrinkled, rough, and doubly serrated on their edges. Their base is unequal, about three inches long, and two broad, of a dark green colour, and stand on short pedicles.

This tree grows in plenty all over England: and its timber is of very great use for divers purposes, as for keels of ships, coffins, water-pipes, mill-works, knaves for wheels, handles for saws, &c. The clearness of its grain makes it also fit for all kinds of carved-work and ornaments relating to architecture.

There are several species of elm, such as the witch-hazle, or broad leaved elm; the smooth leaved or witch elm, and several varieties with variegated leaves, which are noticed by the curious in plants. They all delight in one and the same soil, which should be a good loam to have them in the greatest perfection; not but they will do in other lands.

These trees are increased by layers or suckers. The layers are to be preferred, as they generally arise with a better root: for if they are not well rooted when planted, they make very little progress in their growth, and frequently fail, notwithstanding, to appearance, they may have made tolerable shoots for the first two or three years; therefore we would advise those who plant elms to observe they are well rooted, as otherwise they may be deceived in their expectations.

Elms were formerly, when clipping was more in fashion than at present, much in use for hedges, and no plants are more proper where it is required to break the violence of the winds; but they should not be planted too near walls where fruit-trees are placed against, as they will by the extension of their roots, which spread to a greater distance than is commonly imagined, deprive the other plants of the nourishment requisite for their welfare. In the park elms are delightful, being planted in avenues where their noble shade and verdure demonstrates their grandeur, an example of which may be seen in Greenwich-park, whose delightful walks, so much resorted to, are chiefly adorned with these beautiful and advantageous trees.

In planting elms, it is necessary to observe, that they should not be planted too deep, particularly in loamy or clayey lands, in which latter case it is not amiss to plant them on a little hill, when there will be the less danger of their succeeding; and likewise, if they are designed for timber, not to top the extreme part of the plant, as it impedes their growth, and occasions their decaying soon.

With regard to their medicinal virtues, the leaves are astringent; and the bark good for assuaging the pains of the gout, by a decoction of it reduced to the consistence of a syrup, and a third part of brandy added, and used as a liniment. It also makes a good gargarism for sore mouths, when occasioned by heat and sharpness of humours.

ELOCUTION, in rhetoric, the adapting words and sentences to the things or sentiments to be expressed. It consists in elegance, composition, and dignity. The first, comprehending the purity and perspicuity of a language, is the foundation of elocution. The second ranges the words in proper order; and the last adds the ornaments of tropes and figures to give strength and dignity to the whole. See STYLE, PERIOD, FIGURE, &c.

ELOGY, *Elogium*, a praise or panegyric bestowed on any person or thing, in consideration of its merit. The beauty of elogy consists in an expressive brevity. Elogiums should not have so much as one epithet, properly so called, nor two words synonymous. They should strictly adhere to truth; for extravagant and improbable elogies, rather lessen the character of the person or thing they would extol.

ELOHA, in Scripture, the singular of Elohi, one of the names of God.

ELOHI, ELOI, or ELOHIM, in Scripture, one of the names of God. But it is to be observed, that angels, princes, great men, judges, and even false gods, are sometimes called by this name. The sequel of the discourse is what assists us in judging rightly concerning the true meaning of this word. It is the same as Eloha, one being the singular, and the other the plural. However, Elohim is often construed in the singular number, particularly when the true God is spoken of; but when false gods are spoken of, it is construed rather in the plural.

ELONGATION, in astronomy, is the removal of a planet to the fartheſt distance it can be from the sun, as it appears to an eye placed on the earth.

The word is Latin, from *elongo*, to be distant from.

The utmost elongation of Venus can be but 45 degrees, and that of Mercury but 30 degrees; which is the reason this planet is so rarely seen.

ELOPEMENT, in law, is where a married woman departs from her husband, and cohabits with an adulterer; in which case the husband is not obliged to allow her any alimony out of his estate, nor is he chargeable for necessaries for her of any kind. However, the bare advertising a wife in the Gazette, or other public papers, is not a legal notice to persons in general not to trust her; though a personal notice, given by the husband to particular persons, is said to be good.

An action lies, and large damages may be recovered, against a person for carrying away and detaining another man's wife.

ELOQUENCE, the art of speaking well, so as to affect and persuade.

Cicero defines it the art of speaking with copiousness and embellishment.

Eloquence and rhetoric differ from each other, as the theory from the practice; rhetoric being the art which describes the rules of eloquence, and eloquence that art which uses them to advantage. For the most part, however, they are used indiscriminately for each other.

ELUL, one of the Hebrew months, answering pretty nearly to our August. There are but twenty-nine days in it. It is the twelfth month of the civil year, and the sixth of the ecclesiastical. Upon the seventh or ninth day of this month the Jews fast, in memory of what happened after the return of those who went to view the promised land.

ELUTRIATION, in metallurgy, the separating the lighter matters from the mixed ores of metals, by means of great quantities of fair water.

ELYSIUM, or ELYSIAN FIELDS, in heathen mythology, certain plains, abounding with woods, fountains, verdure, and every delightful object; supposed to be the habitation of heroes and good men, after death.

ELYTROIDES, or VAGINALIS, in anatomy, the

the second proper membrane that involves the testes. See TESTICLE.

EMANCIPATION, in the Roman law, the setting free a son from the subjection of his father; so that whatever moveables he acquires, belong in propriety to him, and not to his father, as before emancipation.

EMARGINATED, among botanists, an appellation given to such leaves as have a little indenting on their summits: when this indenting is terminated on each side by obtuse points, they are said to be obtusely emarginated; whereas, when these points are acute, they are called acutely emarginated.

EMAUX DE L'ESCU, in heraldry, the metal and colour of the shield or escutcheon. See the article SHIELD.

EMBALMING is the opening a dead body, taking out the intestines, and filling the place with odoriferous and desiccative drugs and spices, to prevent its putrifying.

EMBARGO, in commerce, an arrest on ships, or merchandize, by public authority; or a prohibition of state, commonly on foreign ships, in time of war, to prevent their going out of port; sometimes to prevent their coming in; and sometimes both, for a limitted time.

EMBASSADOR, or AMBASSADOR. See AMBASSADOR.

EMBASSY, the office or function of an ambassador.

EMBATTLED, in heraldry, the same with crenelle. See CRENELLE.

EMBER-WEEKS, or DAYS, in the Christian church, are certain seasons of the year set apart for the imploring God's blessing, by prayer and fasting, upon the ordinations performed in the church at such times.

These ordination-fasts are observed four times in the year, viz. the Wednesday, Friday, and Saturday after the first Sunday in Lent, after Whit-Sunday, after the fourteenth of September, and the thirteenth of December; it being enjoined, by a canon of the church, that deacons and ministers be ordained, or made, only upon the Sundays immediately following these ember-fasts.

EMBLEM is a kind of painted ænigma, or certain figures delineated or cut metaphorically, expressing some action, with reflections underneath, which in some measure explain the sense of the device, and at the same time, instruct us in some moral truth, or other matter of knowledge.

EMBLEMENTS, among lawyers, denote the profits of sown lands; but are sometimes used, more largely, for any products that naturally arise from the ground.

EMBOLISMIC, intercalary, or belonging to the embolismus.

The word is derived from the Greek εμβαλλω, to insert, or put in.

EMBOLISMUS, the excess of the solar year above the lunar, whereby the lunations happen every subsequent year eleven days sooner than in the foregoing, which, when they amount to thirty-days, make a new month, called the embolismical lunation, or embolismatical month; which must be added to make the common lunar year equal to the solar.

EMBOLUS, the moveable part of a pump, or syringe, called also the piston or sucker. See the articles PISTON, PUMP, SYRINGE, &c.

EMBOSSING, or IMBOSSING, in architecture and sculpture, the forming or fashioning works in relievo, whether cut with a chissel, or otherwise.

EMBRACE *the Volt*, in the manege. A horse is said to embrace a volt when, working upon volts, he makes a good way every time with his fore-legs.

EMBRASURE, in architecture, the enlargement made of the aperture of a door or window on the inside of a wall; its use being to give the greater play for the opening of the door, or casement, or to admit the more light. When the wall is very thick, they sometimes make embrasures on the outside.

EMBRASURE, in fortification, a hole or aperture in a parapet, through which the cannon are pointed to fire into the moat or field.

Embrasures are generally twelve feet distant from one another, every one of them being from six to seven feet wide without, and about three within: their height above the platform is three feet on that side towards the town, and a foot and a half on the other side towards the field; so that the muzzle may be sunk on occasion, and the piece brought to shoot low.

EMBROCATION, in surgery and pharmacy, an external kind of remedy, which consists in an irrigation of the part affected, with some proper liquor, as oils, spirits, &c. by means of a woollen or linen cloth, or a sponge, dipped in the same.

EMBROIDERY, a work in gold, or silver, or silk thread, wrought by the needle upon cloth, stuffs, or muslin, into various figures. In embroidering stuffs, the work is performed in a kind of loom, because the more the piece is stretched, the easier it is worked.

EMBRYO, in physiology, the first rudiments of an animal in the womb, before the several members are distinctly formed; after which period it is denominated a fœtus. See the articles CONCEPTION, GENERATION, and FOETUS.

EMBRYO PLANT, the same with plantula seminalis. See the article PLANTULA.

EMBRYOTHLASTES, in midwifery, an instrument contrived for breaking the bones, for the more easy extraction of the fœtus, in difficult labours.

EMBRYOTOMY, the cutting a fœtus to pieces whilſt in the womb, practiſed in caſes of neceſſity, when there is no other way of ſaving the mother.

EMBRYULCUS, a hook for extracting the child in difficult labours.

EMERALD, *Smaragdus*, in natural hiſtory, the moſt beautiful of all the claſs of coloured gems, when perfect. It is found ſometimes in the roundiſh or pebble form, ſometimes in the columnar or cryſtalline one; the pebble emeralds, however, are the moſt valued; there are multitudes found of the ſize of a large pin's head, for one of any tolerable bigneſs; though now and then there occur ſtones of the ſize of a horſe-bean, and even up to that of a walnut, tho' this laſt very rare. The pebble emeralds are found looſe in the earth of mountains, and in the beds of rivers; the cryſtalliform ones are uſually met with adhering to a white, opaque, cryſtalline matter, though ſometimes to pieces of jaſper or of the praſius, a coarſer and ſofter gem of the ſame colour, only with ſome tinge of a yellowiſh caſt, and called the root of the emerald. The pebble emeralds are, in their natural ſtate, bright and tranſparent, though leſs gloſſy than the columnar ones; both are always of a perfect and pure green. It has this green in all the different ſhades, from very dark to extremely pale, and is probably ſometimes colourleſs, though the Engliſh jewellers call it white ſapphire.

The ſmaragdus of the ancients, properly ſo called, was evidently the ſame with our emerald; though they comprehended alſo under this name every gem, or even ſtone of any conſiderable beauty, and of a green colour.

To counterfeit EMERALDS. Take of natural cryſtal, four ounces; of red lead, four ounces; verdigriſe, forty-eight grains; crocus martis, prepared with vinegar, eight grains; let the whole be finely pulveriſed and ſifted; put this into a crucible, leaving one inch empty; lute it well, and put it into a potter's furnace, and let it ſtand there as long as they do their pots. When cold, break the crucible, and you will find a matter of a fine emerald-colour, which, after it is cut and ſet in gold, will ſurpaſs in beauty an Oriental emerald.

EMERGENT YEAR, in chronology, the ſame with epocha, whence any æra, or method of reckoning time commences: ſuch is that of the creation of the world, of the birth of our Saviour. See the article EPOCHA.

EMERSION, in philoſophy, is the riſing of any ſolid above the ſurface of a fluid, eſpecially lighter than itſelf, into which it had been violently immerged or thruſt.

EMERSION, in aſtronomy, is the time when any planet that is eclipſed, begins to emerge or get out of the ſhadow of the eclipſing body.

EMERY, *Smiris*, a compact ſtone, ſo hard as to cut glaſs like the diamond; impregnated with iron, and a very ſmall portion of copper. It is met with in Norway, Sweden, England, Saxony, and other countries. Bruckman relates, that the emery found at St. Georgenſtadt, in Miſnia, is ſuperior to the Spaniſh. It is uſed for cutting and poliſhing precious ſtones, for poliſhing agate, porphyry, marble, glaſs, metalline ſpecula, iron and ſteel, and the various utenſils and ornaments made of theſe kinds of ſubſtances: for theſe purpoſes the emery is ground in mills, the powder paſſed through ſieves of different degrees of fineneſs, and thus divided into different ſorments, the fineſt of which, for the nicer uſes, are further divided by waſhing them over ſeveral times with water.

Putty of EMERY, a kind of dirty matter found on the lapidaries wheels, containing part of the powder of emery.

EMETICS, *Emetica*, are medicines which induce vomiting.

EMETOLOGY, that part of medicine which treats of emetics.

The word is formed from the Greek, ἔμετος, a vomit, and λογος, a diſcourſe.

EMINENCE, a title of honour peculiar to cardinals. See the article CARDINAL.

EMINENCE, in the military art, a high or riſing ground, which overlooks and commands the low places about it: ſuch places within cannon-ſhot of a fort, are a great diſadvantage; for if the beſiegers become maſters of them, they can, from thence, fire into the fort.

EMINENTIAL EQUATION, an artificial equation, containing another equation eminently: it is ſometimes uſed in the inveſtigation of the areas of curved-lined figures. See EQUATION.

EMISSARY, in a political ſenſe, a perſon employed by another to ſound the opinions of people, ſpread certain reports, or act as a ſpy over other people's actions. See the article SPY.

EMMENAGOGUES, EMMENAGOGA, in phyſic, are medicines which promote the menſes or monthly courſes.

EMOLLIENTS are ſuch medicines as ſheathe and ſoften the aſperities of the humours, and relax and ſupple the ſolids at the ſame time.

EMPALEMENT *of flowers*, among the botaniſts, the ſame with calyx. See the article CALYX.

EMPASTING, or IMPASTING, in painting, is the laying on of colours thick and bold, or the applying ſeveral lays of colours, ſo as they may appear thick.

The term is alſo uſed when the colours are laid diſtinct and aſunder, and not ſoftened or loſt in each other. See the article COLOURING.

EMPATTEMENT, in fortification, the ſame with talus. See the article TALUS.

EMPRESS,

EMPERESS, or EMPRESS, denotes either the wife of an emperor, or a woman who governs ſingly an empire, in her own right.

EMPEROR, *Imperator*, a title of honour among the ancient Romans, conferred on a general who had been victorious, and now made to ſignify a ſovereign prince, or ſupreme ruler of an empire.

EMPETRUM, berry-bearing-heath, in botany, a genus of the dicœcia claſs of plants in the Linnæan ſyſtem, the flower of which conſiſts of three oval oblong petals: in the male are inſerted three long, propendent, hairy ſtamina: and the fruit of the female flower is an orbiculated, depreſſed, unilocular berry, larger than the cup, containing nine ſeeds placed circularly.

EMPHASIS, in rhetoric, a particular ſtreſs of the voice and action, laid on ſuch parts or words of the oration, as the orator wants to enforce upon his audience. See ACCENT.

EMPHYSEMA, in phyſic, is any flatulent tumour, generally taken for a ſoft one, ariſing from air that is contained in the cells of the membrana celluloſa.

The word is Greek, from ἐν and φυσαω, to inflate,

EMPIRE, *Imperium*, in political geography, a large extent of land, under the juriſdiction or government of an emperor. See the article EMPEROR.

EMPIRIC, an appellation given to thoſe phyſicians who conduct themſelves wholly by their experience, without ſtudying phyſic in a regular way. Some even uſe the term, in a ſtill worſe ſenſe, for a quack who preſcribes at random, without being at all acquainted with the principles of the art.

EMPLASTER, *Emplaſtrum*, in pharmacy, the ſame with plaſter. See PLASTER.

EMPYEMA, in phyſic, is, ſtrictly ſpeaking, a collection of purulent matter, in any part whatſoever; but it generally ſignifies that in the cavity of the breaſt only; and which ſometimes happens upon the opening of abſceſſes, or ulcerations of the lungs, or membranes incloſing the thorax.

The word is derived from the Greek, ἐν, and πυον, purulent matter.

EMPYREUM, a term uſed by divines for the higheſt heaven, where the bleſſed enjoy the beatific viſion.

EMPYREUMA, among chemiſts and phyſicians, the fiery taſte or offenſive ſmell which brandies, with.
and other bodies prepared by fire, are impregnated

EMRODS, or HÆMORRHOIDS. See the article HÆMORRHOIDS.

EMULGENT, or RENAL ARTERIES, thoſe which ſupply the kidneys with blood; being ſometimes ſingle, ſometimes double on each ſide. See ARTERY.

EMULSION, in pharmacy, properly ſignifies medicines which reſemble milk. Thus ſolutions of gums, reſins, or ſpermaceti, made by means of the yolk of an egg, in a proper vehicle, are called emulſions.

EMUNCTORY, in anatomy, a general term for all thoſe parts which ſerve to carry off the excrementitious parts of the blood and other humours of the body. Such more eſpecially are the kidneys, bladder, and moſt of the glands.

EMUSCATION, in gardening and huſbandry, implies the clearing trees from moſs, &c.

ENÆMON, ἐναιμων, in medicine, an epithet often applied by Hippocrates and Galen, to ſuch topical medicines as are appropriated to a wound newly inflicted, before the blood be ſtopped.

ENÆOREMA, in medicine, that pendulous ſubſtance which floats in the urine. It is alſo called ſublimamentum, and nubeculæ, from its reſemblance to little clouds.

ENALLAGE, in grammar, is when a poſſeſſive pronoun is put for a relative, or one mood or tenſe of a verb is put for another, &c.

ENALLAGE, in rhetoric, is a figure whereby the diſcourſe is changed and reverſed, contrary to all the rules of the language; but this is not done altogether at pleaſure, or without reaſon.

ENALURON, according to Guillim, is a border charged all round with birds; though others will have it to ſignify, in orle, or form of a border.

ENAMEL, vulgarly called AMEL, is a kind of coloured glaſs, uſed in painting in enamel.

ENAMEL *Painting*, a ſpecies of painting differing from other kinds of painting, in employing, as a vehicle for the colours to hold the parts together, and bind them to the ground they are laid upon, glaſs or ſome vitreous body; which being mixed with the colours, and fuſed or melted by means of heat, becomes fluid; and having incorporated with the colours in that ſtate, forms together with them a hard maſs when grown cold; and anſwers, therefore, the ſame end in this, as oil, gum-water, ſize, or varniſh, in the other kinds of painting.

ENARTHROSIS, in anatomy, a ſpecies of diarthroſis. See the article DIARTHROSIS.

ENCÆNIA, the name of three ſeveral feaſts celebrated by the Jews in memory of the dedication, or rather purification, of the temple, by Judas Maccabeus, Solomon, and Zorobabel.

This term is likewiſe uſed in church hiſtory for the dedication of Chriſtian churches.

ENCAMPMENT, the pitching of a camp. See the article CAMP.

ENCANTHIS, in ſurgery, a tubercle ariſing either from the caruncula lachrymalis, or from the adjacent

adjacent red ſkin; ſometimes ſo large, as to obſtruct not only the puncta lachrymalia, but alſo part of the ſight, or pupil itſelf.

It is of two kinds, viz. mild, without hardneſs or pain; or malignant, which is livid and very painful. The mild kind is to be treated firſt by ſcarifying, and afterwards applying eſcharotic or cauſtic medicines; and if this proves inſufficient, the tumour may be touched, but with great caution, with lapis infernalis; and to divert the humours from the eye, iſſues and ſetons, with phlebotomy and cooling purges, are proper. If all theſe fail, the ſurgeon is to extirpate the tumour; in which caſe it is better to leave part of the morbid tubercle, than cut off any part of the lachrymal caruncle, as the remains of it may be afterwards cleared away by eſcharotics. After the operation, it is proper to apply deterging and healing medicines, or a collyrium of lapis tutiæ, myrrh, &c. till the wound is healed.

As to the malignant encanthis, inclining to be cancerous, it is generally better to let it alone, and to mitigate its uneaſineſs with cooling and lenient collyria, rather than exaſperate it by the operation, or by eſcharotic medicines.

ENCAUSTICE and ENCAUSTUM, the ſame with enamelling and enamel.

ENCEINTE, in fortification, is the wall or rampart which ſurrounds a place, ſometimes compoſed of baſtions or curtains, either faced or lined with brick or ſtone, or only made of earth. The enceinte is ſometimes only flanked by round or ſquare towers, which is called a Roman wall.

ENCEPHALI, in medicine, worms generated in the head, where they cauſe ſo great a pain, as ſometimes to occaſion diſtraction.

ENCEPPE, in heraldry, denotes fettered, chained, or girt about the middle, as is uſual with monkeys.

ENCHANTER, a perſon ſuppoſed to practiſe enchantment, or faſcination.

ENCHASING, INCHASING, or CHASING, the art of enriching and beautifying gold, ſilver, and other metal-work, by ſome deſign, or figures repreſented thereon, in low relievo.

ENCHYSMA, in medicine, the ſame with clyſter. See the article CLYSTER.

ENCLITICA, in grammar, particles which are ſo cloſely united with other words, as to ſeem part of them, as in *virumque*, &c.

There are three enclitic particles in Latin, viz. *que*, *ne*, *ve*; but there are a great many in the Greek, as τε, τε, με, μοι, σε, σοι, &c.

ENCRATITES, *Encratitæ*, in church hiſtory, heretics who appeared towards the end of the ſecond century: they were called Encratites, or Continentes, becauſe they gloried in abſtaining from marriage, and the uſe of wine and animal food. Their chaſtity, however, was a little ſuſpected, on account of their uſing all ſorts of means to draw women into their ſect, and always keeping company with them.

ENCROACHMENT, or INCROACHMENT, in law. See INCROACHMENT.

ENCYCLOPÆDIA, the circle of arts and ſciences.

The word is formed from the Greek εν, in, κυκλος, a circle, and παιδειαι, art, ſcience, or learning.

ENDECAGON, in geometry, the ſame with hendecagon. See HENDECAGON.

ENDEMIC, or ENDEMICAL DISEASES, thoſe to which the inhabitants of particular countries are ſubject more than others, on account of the air, water, ſituation, and manner of living.

The word is derived from the Greek εν, in, and δημος, people.

ENDIVE, in botany, a plant much uſed as a ſallad in winter with us, of which there are different varities; but the ſort which is moſt cultivated here is the curled leaved endive. The ſeaſons for ſowing the ſeeds is at different periods, to continue the plants in perfection, as in May, June, July and Auguſt: they are afterwards planted out in rows at about a foot aſunder; and when grown to their full ſize of foliage, ſhould be blanched in order to make them more tender, and to take off the bitterneſs which they have when green. Thoſe of the early ſowing may be only tied up to whiten them: but thoſe for winter uſe ſhould be taken up when dry, and laid in on the ſide of a trench of earth to their tops, which will prevent the froſt or wet from damaging them, obſerving to cloſe their leaves ſo as no earth may get in their hearts.

Another ſort, called by ſome Batavian endive, hath broad leaves; and in taſte and appearance approaches nearer to lettuce than the other ſorts. This of late years have been introduced into the Engliſh gardens, and is managed as the former.

For the generical characters and medicinal virtues of endive. See the article CICHORIUM, of which it is a ſpecies.

ENDORSE, in heraldry, an ordinary, containing the eighth part of a pale, which Leigh ſays is only uſed when a pale is between two of them.

ENDORSED, *Endorſé*, in heraldry, is ſaid of things borne back to back, more uſually called adoſſé.

ENDOWMENT, in law, denotes the ſettling a dower on a woman; though ſometimes it is uſed figuratively, for ſettling a proviſion upon a parſon on the building of a church; or the ſevering a ſufficient portion of tithes for a vicar, when the benefice is appropriated.

ENEMA, in medicine, the ſame with clyſter. See the article CLYSTER.

ENEMY, in law, an alien or foreigner, who publicly invades the kingdom.

ENERGUMENS, in church hiſtory, perſons ſuppoſed to be poſſeſſed by the devil, concerning whom there

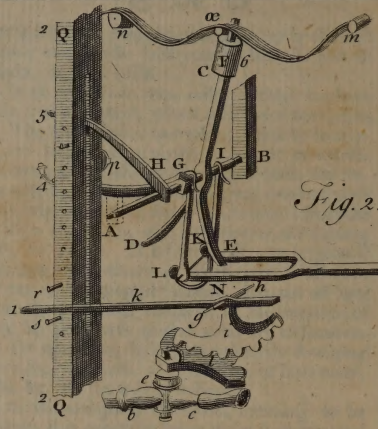
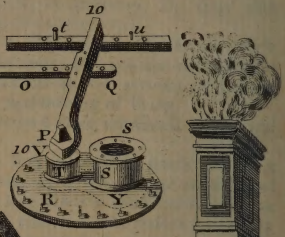


Fig. 2. Engine.



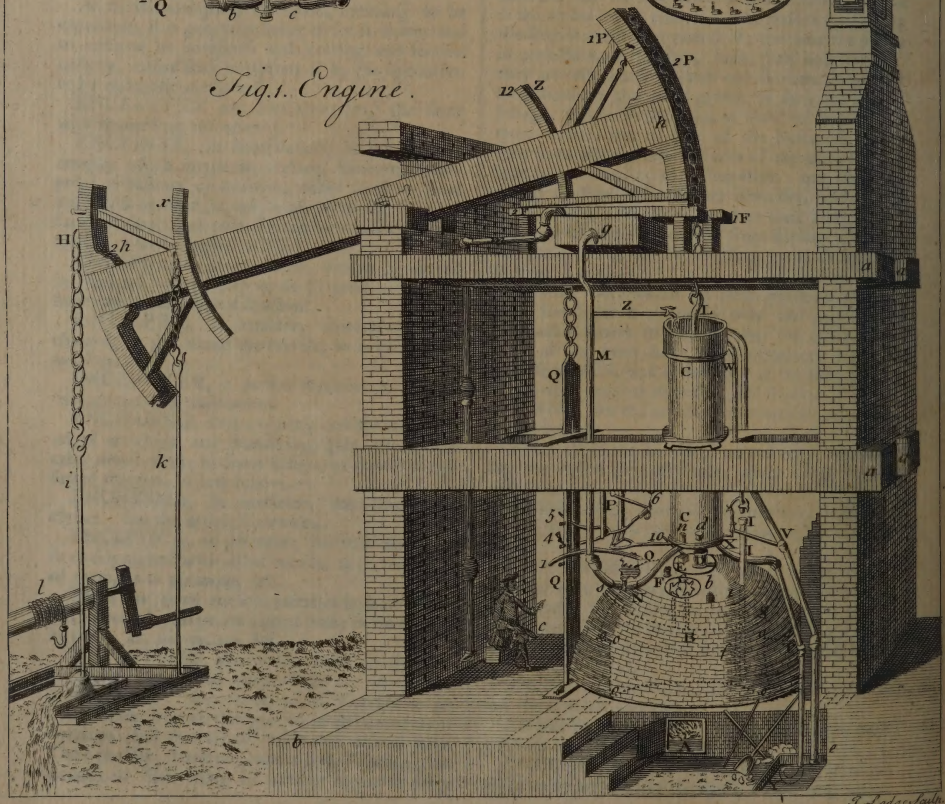


Fig. 1. Engine.

T. Lodge Sculp.

there were many regulations among the primitive Chriſtians.

They were denied baptiſm, and the euchariſt; at leaſt this was the practice of ſome churches: and though they were under the care of exorciſts, yet it was thought a becoming act of charity to let them have the public prayers of the church, at which they were permitted to be preſent. See the article EXORCISM.

ENERGY, ἐνέργεια, a term of Greek origin, ſignifying the power, virtue, or efficacy of a thing. It is alſo uſed, figuratively, to denote emphaſis of ſpeech. See EMPHASIS.

ENFILADE, in the art of war, is uſed in ſpeaking of trenches, or other places, which may be ſcoured by the enemy's ſhot, along their whole length. In conducting the approaches at a ſiege, care muſt be taken that the trenches be not enfiladed from any work of the place. See the article TRENCHES.

ENFRANCHISEMENT, in law, the incorporating a perſon into any ſociety or body politic: thus, where any perſon is enfranchiſed, or made free, of any city, borough, or company, he is ſaid to have a freehold therein during life; and cannot, for barely endeavouring any thing againſt the corporation, forfeit the ſame.

Naturalization is alſo another kind of enfranchiſement. See NATURALIZATION.

ENGASTRIMYTHI, in pagan theology, the pythians or prieſteſſes of Apollo, who delivered oracles from within, without any action of the mouth or lips.

ENGINE, in mechanics, is a compound machine, made of one or more mechanical powers, as levers, pullies, ſcrews, &c. in order to raiſe, project, or ſuſtain any weight, or produce any effect which could not be eaſily effected otherwiſe.

Engines are extremely numerous; ſome uſed in war, as the battering-ram, ballиſta, waggons, chariots, &c. others in trade and manufactures, as cranes, mills, preſſes, &c. others to meaſure time, as clocks, watches, &c. and others for the illuſtration of ſome branch of ſcience, as the orrery, cometarium, and the like. See BATTERING-RAM, BALLISTA, &c.

In general we may obſerve, concerning engines, that they conſiſt of one, two, or more of the ſimple powers variouſly combined together; that in moſt of them the axis in peritrochio, the lever, and the ſcrew, are the conſtituent parts; that in all a certain power is applied to produce an effect of much greater moment; and that the greateſt effect, or perfection, is when it is ſet to work with fourninths of that charge which is equivalent to the power, or will but juſt keep the machine in equilibrio. See the articles MAXIMUM and MECHANICS.

In all machines, the power will juſt ſuſtain the weight, when they are in the inverſe ratio of their diſtances from the center of motion. See the article POWER and EQUILIBRIUM.

It being of the utmoſt importance to diminiſh the friction of engines, ſeveral contrivances have been invented for that purpoſe. See the article FRICTION.

ENGINE *for extinguiſhing fires*, a machine for raiſing a conſiderable quantity of water, in one continued ſtream, for the extinguiſhing accidental fires. See a perſpective view of the whole engine, ready for working, in plate XLVIII. *fig.* 3.

The nature and effect of this engine will be eaſily underſtood from a perpendicular ſection of it, repreſented, *fig.* 4. The water is raiſed by the preſſure of the atmoſphere, by the force of piſtons, and by the ſpring of condenſed air, in the following manner: thus, when the piſton R is raiſed, a vacuum would be made in the barrel T V, did not the water follow it from the inferior canal E M, through the valve H, which riſes through the tube E F, immerſed in the water of a veſſel, by the preſſure of the atmoſphere on the ſurface thereof. By the depreſſion of the piſton R, the water in the barrel T V is forced through the ſuperior canal O N, to enter by the valve I, into the air-veſſel *a b c d*; and the like being done alternately by the other barrel W X, and its piſton S, the air-veſſel is by this means continually filling with water, which greatly compreſſes the air above the ſurface of the water in the veſſel, and thereby proportionably augments its ſpring, which is at length ſo far increaſed, as to re-act with great force on the ſurface Y Z of the ſubjacent water; which aſcending through the ſmall tube *e f*, to the ſtop-cock *p*, is there, upon turning the cock, ſuffered to paſs through a pipe *h*, fixed to a ball and ſocket, from the orifice of which it iſſues with a great velocity, to a very great height or diſtance, in a continued ſtream, directed every way, or to any particular place, by means of the ball and ſocket.

The greateſt artifice of this engine is its contrivance to produce a continual ſtream, which is done by compreſſion, and the conſequent increaſed elaſticity of the air in the barrel *a b c d*, called the air-veſſel: for the air, being an elaſtic fluid, will be capable of compreſſion in any degree by the water forced in through the valves at I K; and, ſince the force of the air's ſpring will always be inverſely as the ſpace which it poſſeſſes, it follows, that when the air-veſſel is half full of water, the air will be compreſſed into half the ſpace it poſſeſſed at firſt, and therefore its ſpring will be twice as great as at firſt.

But this ſpring at firſt was equal to the preſſure of the atmoſphere; for if it was not, it could not have ſuſtained or reſiſted the preſſure of the atmoſphere which ſtood over it, and conſequently could not have filled the veſſel before the water was driven

in;

in; which yet we find it did, and maintained an æquilibrium with the common air.

The veſſel then being half filled with water, or the air compreſſed into half its firſt ſpace, its ſpring will be in this caſe equal to twice the preſſure of the atmoſphere; and therefore, when the ſtop-cock at *p* is turned, the air within the ſubjacent water, with twice the force it meets with from the external air in the pipe *ef*, will cauſe the water to ſpout out of the engine to the height of thirty-two or thirty-three feet, if the friction be not too great.

When the air-veſſel is $\frac{2}{3}$ full of water, the ſpace which the air takes up is only $\frac{1}{3}$ of its firſt ſpace; whence its ſpring being three times as great as that of the common air, it will project the water with twice the force of the atmoſphere, or throw it to the height of 64 or 66 feet. In the ſame manner, when the air-veſſel is $\frac{3}{4}$ full of water, the air will project it to the height of 96 or 99 feet; and when $\frac{4}{5}$ full of water, to the height of 132 feet.

As the air-veſſel is the cauſe of the continual ſtream, we may naturally infer that, if ſuch an air-veſſel were adapted to the common houſe-pump, it would then become a fire-engine, or very uſeful for extinguiſhing fires that may happen in or near the houſe. Now this may be effected in a manner, either the ſame with, or analogous to, that which follows: A B C D (*fig.* 5.) is the barrel of the pump, P H the rod and piſton; C W the pipe going down to the water of the well at W; towards the lower part of the barrel is a ſhort tube, by which the air-veſſel F E is fixed to, and communicated with, the barrel of the pump. A M N L is a collar of leather ſo fixed on the top of the barrel, and adapted to the rod, that it may move freely in the leather, without permitting the air to paſs in or out between. The nozzle or ſpout D has a ſtop-cock S to ſhut off the water, or let it paſs out as required. Q is a piece ſcrewed on to direct the ſtream by a ſmall pliant leathern pipe at the end.

Now it is plain, when the piſton is raiſed from the bottom of the pump-barrel, the water above it will be forced into the air-veſſel, and there compreſs the air, the ſtop cock being ſhut; it will alſo compreſs the air on the top of the barrel, for the water will not be higher than the ſpout D at firſt, when the ſtop-cock is ſhut: but afterwards, as the air is confined, it will be compreſſed at top, and the water will riſe to I.

This compreſſed air, in each place, will act upon the water by its ſpring, and upon turning the ſtop-cock, will force it out in a continual ſtream, through a pipe at Q; and with a greater or leſſer degree of force, as occaſion requires, that being abſolutely in the power of the perſon working the pump. This invention we owe to the learned Sir James Creed.

Fire ENGINE, or *Steam* ENGINE, a machine for raiſing water by the help of fire. The fire-engine is the moſt admirable, curious, and compounded machine that we find among all thoſe whoſe inventions have been owing to the diſcoveries of modern philoſophy, and which affords the greateſt advantages to mankind. The fire-engine is of two ſorts, of which we ſhall here give the theory and figures of each, according to the lateſt perfection in which they are made.

The marquis of Worceſter, in his century of inventions, publiſhed in the year 1663, is probably the firſt who propoſed raiſing great quantities of water by the force of fire turning water into a ſteam; and he mentions ſome engine of this kind, which he ſays played a continual ſtream, in the manner of a fountain, forty feet high. He alſo ſays, that a perſon attending it turned two cocks; that one veſſel of water being conſumed, another begins to force and re-fill with cold water; and this alternately and ſucceſſively, the fire being attended and kept conſtantly burning by the ſame perſon, in the interim between the turning the cocks.

Captain Savery, having read this account, immediately attempted to raiſe water by fire, and was the firſt who erected an engine for this purpoſe, in the form we have ſince had them. To ſecure the invention to himſelf, he purchaſed all the books that were to be found, printed by the marquis upon that occaſion, and burnt them; and at the ſame declared that he found out the method by accident. He made many experiments to bring the machine to perfection, and erected ſeveral for gentlemen's ſeats.

But the progreſs of the engine was ſtopped, till long time afterwards, when Mr. Newcomen and Mr. J. Cawley contrived another way to raiſe water by fire, where the ſteam to raiſe the water from the greateſt depths of mines is not required greater than the preſſure of the atmoſphere; and this is the preſent ſtructure of the engine, which is now of of about fifty-five years ſtanding.

We ſhall ſhew, under the article PUMP, that water may be drawn from any depth by a compound pump. Suppoſe the depth = 150 feet, and the diameter of the pump at plate XLIX. *fig.* 1. be $7\frac{1}{2}$ inches, then the weight of a cylindric column of water 150 feet high, and $7\frac{1}{2}$ inches diameter, will be about 3000 lb weight. If now the rod of this pump were hung by a chain to the end of the lever *h h*, as at H, and at the other end another power was applied, as at L, with a ſuperior force, the pump might be worked, and the water raiſed by that power.

Now this power cannot be human, or the ſtrength of man; for it will require a hundred men to pull down the beam, each pulling with the force of thirty pounds; and an hundred men to relieve them, when weary; for the pump in a mine muſt not ſtand ſtill: but two hundred men would be too expenſive. If we allow horſes, and one horſe equal to five men, there muſt be twenty horſes working at a time, and twenty more

more to relieve these; which great number of horses, though less expensive than the men, will be found too great for most mines: and neither men nor horses would be able to give more than fifteen or sixteen strokes in a minute.

Some other power therefore must be applied, and this may be effected as follows: B is a large boiler, whose water, by the fire under it, is converted into an elastic steam. The great cylinder C C is fixed upon it, and communicates with it by the pipe D *d*; on the lower orifice of which, within the boiler, moves a broad plate, by means of the steam-cock, or regulator E 10, stopping or opening the passage to prevent or permit the steam to pass into the cylinder, as occasion requires. The diameter of the pipe D is about four inches.

The steam in the boiler ought always to be a little stronger than the air, that when let into the barrel, it may be a little more than a balance to the external air, which keeps down the piston at the bottom *d n*. The piston being by this means at liberty, the pump-rod will, by its great weight, descend at the opposite end to fetch a stroke; for the weight of seventy or eighty yards of iron rod amounts to nine or ten hundred weight; whereas the piston, and other weights at the other end, is not above four or four and a half hundred weight. The end of the lever at the pump, therefore, will always preponderate the other, and descend when the piston is at liberty.

The handle of the steam cock E 10, being turned towards *n*, opens a pipe D to let in the steam; and being turned towards O, it shuts it off, that no more can enter. The piston is now raised towards the top of the barrel at C, and the barrel is full of steam. The lever O 1 must then be lifted up, to turn, by its teeth, the injecting cock at N, which permits the water brought from the cistern *g*, by the pipe *g* M N, to enter the bottom of the barrel at *n*, where it flies up in the form of a fountain, and striking against the bottom of a piston, the drops, being driven all over the cylinder, will, by their coldness, condense the steam into water again, and precipitate it to the bottom of the barrel.

Mr. Henry Beighton made an experiment to determine the rarity of the steam, and found the content of the barrel of steam was 113 gallons; and since there were sixteen strokes in a minute, therefore $113 \times 16 = 1808$ gallons of steam per minute. He also observed, that the boiler required to be supplied with water at the rate of five pints per minute: and since 282 cubic inches make a gallon, $35\frac{1}{4}$ make a pint, and $5 \times 35\frac{1}{4} = 176\frac{1}{4}$ in five pints; also the cubic inches of steam are $1808 \times 282 = 509856$; if then we say, as $176\frac{1}{4} : 509856 :: 1 : 2893$; or one cubic inch of water is expanded into 2893 inches of steam; consequently the steam in the barrel is reduced to $\frac{1}{2893}$ part, when turned to water by the jet of cold water; and therefore a sufficient vacuum is made in the barrel, for the piston to descend unbalanced, by the pressure of the air.

The piston being forced down, raises the other end of the lever, and consequently the piston of the pump which brings up and discharges the water at *p*. Now this whole operation of opening and shutting the steam regulator and injection-cock, will take up but little more than three seconds; and will therefore produce very well sixteen strokes in a minute.

That the cistern *g* may always be supplied with water, there is an arch *x* fixed near the arch H at the pump-end, from whence another pump rod *k*, with its piston, draws water from a small cistern near the mouth of a pit, supplied from the water raised at *p*, and forces it up the pipe *m m m* into the cistern *g*, which, therefore, can never want water.

That the leathers of the piston C may be always supple and swelled out so as to be always air-lights, a small stream of water is supplied from the injecting pipe M by the arm *z*. On the top of the cylinder is a larger part or cup L, to hold the water that lies on the piston, lest it should overflow when the piston is got to its greatest height, as at W; at which time, if the cup be too full, the water will run down the pipe V to the waste-well at Y.

The water in the boiler which wastes in generating steam, is supplied by a pipe I *i* about three feet long, going into the boiler a foot below the surface of the water. On the top of this pipe is a cup or funnel I, supplied by the pipe W with water from the top of the cistern, which has the advantage of being always warm, and not so apt to check the boiling of the water in the copper.

That the boiler may not have the surface of the water too low, which would endanger bursting, or too high, which would not have room enough for steam, there are are two gage-pipes at G; one going a little below the surface of the water when at a proper height, and the other standing a little above it. When every thing is right, the stop-cock of the shorter pipe, being open, gives only a steam, and that of the long one water; but, if otherwise, both cocks will give steam when the surface is too low, and both give water when it is too high; and hence the cock which feeds the boiler at I may be opened to such a degree, as always to keep the surface of water to its due height.

The cold water, constantly injected into the cylinder to condense the steam, is carried off by the eduction-pipe *d* T Y, going from the bottom of the cylinder to the waste-well Y, where going a little under water, it has its end turned up, with a valve Y, to keep the air from pressing out into the pipe, but permitting the injected water coming the other way to be discharged, whereby the cylinder is kept empty.

Lest the steam should grow too strong for the boiler, and burst it, there is a valve fixed at *h*, with a perpendicular wire standing up from the middle of it,

it, to put weights of lead upon, by which to examine the ſtrength of the ſteam puſhing againſt it from within. Thus the ſteam is known to be as ſtrong as the air, if it will raiſe up ſo much weight on the valve, as is at the rate of fifteen pounds to an inch ſquare; becauſe that is the weight of air, nearly, on every ſquare inch. When the ſteam becomes ſtronger than is required, it will lift up the valve, and go out. This valve is called the puppet-clack.

The ſteam has always a variable ſtrength, yet never $\frac{1}{10}$ ſtronger or weaker than common air: for it has been found that the engine will work well when there is the weight of one pound on each ſquare inch of the valve *b*. This ſhews that the ſteam is then $\frac{1}{10}$ part ſtronger than the common air. Now as the height of the feeding-pipe from the funnel F to the ſurface of the water *S s* is not above three feet, and three feet and a half of water is $\frac{1}{10}$ of the preſſure of the air; if the ſteam were $\frac{1}{10}$ part ſtronger than air, it would puſh the water out at E; which, ſince it does not, it cannot be ſtronger than air, even in this caſe, where, the regulator being ſhut, it is moſt of all confined.

When the regulator is opened, the ſteam gives the piſton a puſh, which riſes it up a little way; then filling a greater ſpace, it comes to be of the ſame ſtrength, and ſo a balance to the atmoſphere; thus the piſton, being at liberty, riſes to the top W. The ſteam, now expanded into the whole capacity of the cylinder, is weaker than the air, and would not ſupport the piſton, were it not for the greater weight at the other end of the lever, which keeps it up. The ſteam each ſtroke drives the injected water of the preceding ſtroke out of the eduction pipe *d* T Y, and would itſelf follow, and blow out at the valve Y, which is not loaded, if it were ſtronger than the air, which it never does. If it were exactly equal to the ſtrength of the air, it would juſt drive all the water out at Y, but could not follow itſelf, the preſſure being on each ſide the valve equal by ſuppoſition. If it be weaker than the air, it will not force all the water out of the pipe *d* T Y, but the ſurface will ſtand, ſuppoſe, at T, where the column of water T Y, added to the ſtrength of the ſteam, is equal to the preſſure of the air. When the ſteam is $\frac{1}{10}$ weaker than the air, the height T Y = three feet and a half. Now, ſince the whole perpendicular diſtance from *d* to Y is but four feet, and the ſteam always ſufficient to expel the water; it is plain it can never be more than $\frac{1}{10}$ part weaker than the air, when weakeſt.

There is air in all the water injected; and though that air cannot be taken out or condenſed with the ſteam, yet will it precipitate and fall through the ſteam to the bottom of the cylinder, as being much heavier. For ſteam is to water, as 1 to 2893, in its denſity; but the denſity of air is to that of water, as 1 to 864, nearly; therefore, the rarity of ſteam is to that of air, as 2893 to 864; the air will, therefore, fall through the ſteam to the bottom, and from thence be driven out through a ſmall pipe opening into the cup at 4, on which is a valve. Now, when the ſteam firſt ruſhes into the cylinder, and is a little ſtronger than the outward air, it will force the precipitated air to open the valve at 4, and make its eſcape; but the ſteam cannot follow, becauſe it is weaker than the outward air, as the piſton gives it room by aſcending to expand. This valve, from the noiſe it makes, is called the ſnifting-clack.

Among the greateſt improvements of this engine, we may reckon that contrivance by which the engine itſelf is made to open and ſhut the regulator and injunction-cock, and that more nicely than any perſon attending could poſſibly do it. For this purpoſe, there is fixed to an arch 12, at a proper diſtance from the arch P, a chain, from which hangs a perpendicular piece or working beam Q Q, which comes down quite to the floor, and goes through it in a hole, which it very exactly fits. This piece has a long ſlit in it, and ſeveral pin-holes and pins, for the movement of ſmall levers deſtined to the ſame office of opening and ſhutting the cocks, after the following manner:

Between two perpendicular pieces of wood on each ſide, there is a ſquare iron axis A B (*fig.* 2.) which has upon it ſeveral iron pieces of the lever kind. The firſt is the piece C E D, called the Y, from its repreſenting that letter inverted by its two ſhanks E and D; on the upper part is a weight F to be raiſed higher or lower, and fixed, as occaſion requires. This Y is fixed very faſt upon the ſaid iron axle A B.

From the axle hangs a ſort of an iron ſtirrup I K L G, by its two hooks I G, and having on the lower part two holes K, L, through which paſſes a long iron pin L K, and keyed in the ſame. When this pin is put in, it is alſo paſſed through the two holes in the ends E, N, of the horizontal fork or ſpanner E Q N, joined at its end Q, to the handle of the regulator V 10. From Q to O are ſeveral holes, by which the ſaid handle may be fixed to that part of the end which is moſt convenient.

Upon this axis A B is fixed at right angles to the Y, an handle or lever G 4 which goes on the outſide of the piece Q 2, Q 2, and lies between the pins. Another handle is alſo faſtened upon the ſame axle, viz. H 5, and placed at half a right angle to the former G 4; this paſſes through the ſlit of the piece Q 2, Q 2, lying on one of the pins. Hence we ſee, that when the working beam goes up its pin in the ſlit, it lifts up the ſpanner H 5, which turns about the axle ſo faſt, as to throw the Y, with its weight F, from C to 6, in which direction it would continue to move, after it had paſſed the perpendicular, were it not prevented by a ſtrap of leather fixed to it at *a*, and made faſt at the ends

m and *n*, in such a manner as to allow the Y to vibrate backwards and forwards about a quarter of a circle, at equal distances on this side, and that of the perpendicular.

As things are represented in the figure, the regulator is open, its plate TY being shewn on one side the pipe S, which joins the cylinder and boiler. The piston is now up, and also the working beam near its greatest height; the pin in the slit has so far raised the spanner H 5, that the weight F, on the head of the Y, is brought so far from *u*, as to be past the perpendicular, and ready to fall over towards *m*, which, when it does, it will by its shank E, with a smart blow, strike the iron pin KL, and drawing the fork horizontally towards the beam Q, will draw the end 10 of the regulator towards 6, and thereby shut it, by slipping the plate Y under the holes of the throat-pipe S.

Immediately after the regulator is shut, the beam rising a little higher, with its pin S on the outside upon the lower part, lifts up the end *k* 1 of the handle of the injection-cock, and opens it by the turning of the two parts with teeth. The jet immediately making a vacuum, the beam again descends, and the pin *r*, depressing the handle *k* 1, shuts the injection-cock; and the beam continuing to descend, the pin *p* bears down the handle G 4, and throwing back the Y, its shank D throws forward the fork NQ, and again opens the regulator to admit fresh steam. After this, every thing returns as before; and thus is the engine most wonderfully contrived to work itself. After the engine had been made, as above described, for many years, it received another improvement of very great advantage; and that was, instead of feeding the boiler with warm water from the top of the cylinder, by the pipe W (*fig.* 1.) above, and F *f* below, they contrived to supply it with the scalding hot water which comes out of the eduction-pipe *d* TY, which now, instead of going to the waste-well at Y, was turned into the boiler on the top part; and as the eduction-pipe before went out at the side of the cylinder, it was now inserted in the bottom of the same; and though the pressure of steam in the boiler be somewhat stronger in the cylinder, yet the weight of water in the eduction-pipe, being added to the force of steam in the cylinder, will carry the water down continually, by overcoming rhe resistance in the boiler.

This is the lever-engine with the improvements of Mr. Newcomen and others; but as captain Savery's, or rather the marquis of Worcester's, is very cheap in respect of this machine, and as it is also applicable with great advantage when the height to which the water is to be raised does not exceed 100 or 150 feet, we shall here subjoin a view of that engine, with the improvements of Dr. Desaguliers.

The boiler BB (plate L. *fig.* 2.) is a large copper body of a globular form, which will best of all withstand the very great force of steam, that is in this case necessary. Round the body of this boiler the fire and flame are conducted, as shewn at TTT. It has a copper cover screwed on, which contains the steam-pipe CD, and two gage-pipes N, O, which, by turning their cocks, shew the height of the surface of the water within, as in the other engine.

On the same cover at P is a valve, over which lies a steelyard, with its weight Q to keep it down, the strength of the vapour being this way most exactly estimated: for being in the nature of a lever of the third sort, it is plain, if the beam of the lever be divided into ten equal parts, and the first of them be upon the middle of the valve, and the weight Q hangs at the second, third, fourth, &c. division, that then the force of the steam which can raise up the valve will be two, three, four, &c. times as great as the weight. If the area of the valve be a square inch, and Q = 15 pounds, hanging at the second division, is raised by a steam pushing up the valve, it will shew the steam will then press with the force of two atmospheres; but great care must then be taken about it, lest the steam, so very strong, burst the boiler to pieces.

The steam is carried from the boiler to the copper-vessel A, by means of the pipe CD; and is let into the same by turning the handle K of the steam-cock DI. The key of this cock is kept down by the screw L, and held up by the gibbet DL. The handle turned from K to *k*, admits a passage to the steam into the copper receiver A.

This receiver A communicates at bottom with the suction-pipe ZH going down to the water H in the well X; and above, with the forcing pipe EE, which goes up a little above the water of the reservoir R; between these two pipes are two valves F and G, both opening upwards. The steam being let in upon the water of the receiver A, forces it up the valve F, and the pipe EE, to the reservoir, and then the said receiver is full of hot steam.

This steam, in the receiver, is condensed by a jet of cold water coming from the forcing-pipe, by the small pipe MI, being let in and shut off by the cock at M. The steam being condensed by this jet, will be reduced to a very small space, and so make a vacuum: upon which the water in the well will rush up the forcing-pipe to restore the æquilibrium, and thus again fill the receiver A; the little air being compressed within a small compass at the top above *a b*.

That there may be always water in the force-pipe for the jet, there is a little pipe which brings the water to it from the reservoir, with the small stop-cock Y to shut it off upon occasion. The valves at F and G are examined at any time, by unscrewing the pin *r* to loosen the strap 2, and let down the flanch 3; all which parts are shewn larger in *fig.* 2.

By the particular contrivance of the cock at DI, and

and its key, the water is made to pass from the force-pipe to the boiler, to supply the waste in steam. This is plainly shewn in the section of the cock and key, where 5 is the top of the key; 6 is a hole on one side, which goes down to the bottom to convey the steam or jet of water alternately to the receiver; 7 is a notch on the other side, to take in the water from the force-pipe, and conduct it to the boiler B. How this is done is easy to conceive from a view of the two sections of the cock and key in two positions within it.

The boiler may hold five or six hogsheads, and the receiver one hogshead per hour. This steam makes a vacuum so effectually, as to raise water from the well to the height of 29 or 30 feet; and suppose the steam able to lift up the steelyard, with its weight hanging at the sixth division, it will then be able to raise a column of water about 50 yards high, as being then six times stronger than the pressure of the air, as is easily understood from what has been said under ENGINE *for extinguishing Fires*, the water being raised in a similar manner in both machines; there by the pressure of condensed elastic air, and here by the pressure of rarefied elastic steam.

The elasticity of the steam increasing with its heat, and the space, into which it endeavours to expand itself, being as its elasticity or strength, and since we know that water expanded into vapour, of the same strength of the air, occupies near 3000 times the space as before, it follows, that, when the steam has twice that strength, it will be expanded into 6000; if it be five times as strong as the air's spring, it will become expanded into 15000 times that space, and so on, beyond the reach of experiments; from all which it appears, how near a perfect vacuum we may approach by this engine, or any other, by means of rarified vapours.

The following engine, which was invented by Mr. De Moura of Portugal, F. R. S. is an improvement of that above described, as it is rendered capable of working itself.

This engine consists in a receiver, a steam, and an injection-cock; a suction and a forcing-pipe, each furnished with a valve; together with a boiler, which, on account of its bulk and weight, was not sent with the rest; but, as it may be of the common globular shape, and having nothing particular in its construction, a description of it will not be necessary; as also, the rest of these parts already mentioned being essential to every machine of this kind, a farther account of them may be dispensed with. What is peculiar to this engine, is a float within the receiver, composed of a light ball of copper, which is not loose therein, but fastened to the end of an arm, which is made to rise and fall by the float, while the other end of the arm is fastened to an axis; and consequently, as the float moves up and down, the axis is turned round one way or the other. This axis is made conical, and passes through a conical socket; which last is soldered to the side of the receiver. Upon one of the ends of the axis, which projects beyond the socket, is fitted a second arm, which is also moved backward and forward by the axis, as the float rises and falls. By these means, the rising and falling of the surface of the water within the receiver communicates a correspondent motion to the outside, in order to give proper motions to the rest of the geer, which regulates the opening and shutting of the steam and injection-cocks; and serves the same purpose as the plug-frame, &c. in Newcomen's engine. The particular construction and relation of those pieces will better appear by the figure and references, than can be done by a general description.

A B, (*fig.* 1.) an arm, which is fastened to *a b*, a conical axis, which goes through a conical socket in C, a triangular piece soldered to the receiver. This piece has this shape to give liberty to the arm to rise and fall, that carries the float on the inside. D E is a small cistern soldered to the receiver, which, being kept full of water, keeps the axis and socket air-tight. This cistern is constantly kept full of water, by means of a small leakage through the wooden peg *c*, which follows the packthread *e d* to the cistern.

e is a small weight to counterpoise the float within.

f, is a slider, which being set nearer to, or farther from, the axis, will rise or fall a greater or lesser space, as may be required; and is fastened by the screw *g*. This slider is furnished with a turn-about, *h i*, which is also fastened by a screw, and not at the end *i*, and serves to adjust the length of F G G H, a chain, which gives motion, by means of the shorter chain *k l*, to I K L, the balance, which opens and shuts the cocks; and moves upon the small axis L.

G, G, are two pullies supported by two arms that are fastened to the side of the receiver, and give the chain a proper direction in order to move the balance.

M N is the steam-cock; the end N being supposed to be detached from a pipe that gives it communication with the boiler.

O is the injection-cock, whose key is turned by the arm O *m*.

P Q is the injection-pipe, communicating between the forcing-pipe above the valve, and the top of the receiver.

R S is the arm by which the key of the steam-cock is worked.

I, K, two rollers annexed to the balance, which is furnished with two small rollers, *n*, *o*, which open and shut the injection-pipe, by acting upon the arm O *m*, in such a manner, that when the steam-cock is opened, the injection is shut, and *vice versa*.

T is

T is a bell of advice, which, moving along with the balance, continues to ring as long as the engine is at work.

V is a cock which ſerves to diſcharge the air from the receiver, and is opened by hand when neceſſary.

W is a weight ſufficient to raiſe the balance to a perpendicular poſture, when it is inclined to the right, and alſo to overcome the friction of the float, axis, pullies, chain, &c.

To put the engine in motion, preſs down the arm A B, which will bring the balance over to the right ſide, and in its motion will open the ſteam-cock, and ſhut the injection; ſet open the cock at V, that the air may be diſcharged by the entrance of the ſteam into the receiver. This being done, ſhut that cock, and let go the arm; the weight W will bring over the balance to the left, and in its motion ſhut the ſteam-cock, and open the injection; this preſently condenſing the ſteam into water, in a great meaſure, leaves a vacuum in the receiver. Things remain in this ſituation, till the preſſure of the atmoſphere has cauſed the water to mount through the ſuction-pipe into the receiver, where, as its ſurface riſes, it cauſes the float to aſcend; and, depreſſing the arm A B, raiſes the balance till it has paſſed the perpendicular; and in its deſcent, which is done by its own gravity, the roller K lays hold of the arm R S, again opens the ſteam-cock, and ſhuts the injection. The receiver being now almoſt filled with water, the balance cannot return till the ſurface of the water therein ſubſides, and ſuffers the float to deſcend. This is performed by the elaſticity of the ſteam, which, at the ſame time that it fills the receiver, drives out the water through the forcing-pipe; and when the ſurface is deſcended ſo low as to ſuffer the weight W to bring the balance beyond the perpendicular towards the left, it then falls of its own accord, and, in falling, the roller I lays hold of the arm R S, ſhuts the ſteam-cock, and opens the injection as above.

When the engine is deſired to be ſtopped, obſerve, when the balance lies to the right, to turn round the arm O *m* of the injection-cock, ſo that the tail of the ſteam-cock may miſs it in the next motion; ſo that at the ſame time that the receiver is filled with ſteam, and the ſteam-cock ſhut, the injection not being opened, the motion will ſtop for want thereof.

In the Philoſophical Tranſactions, N°. 461, there is an account of an improvement made in the ſteam-engine by Mr. Paine, as follows: He has contrived two iron pots, or veſſels, of a conical form, inverted, as repreſented by A B E F (*fig.* 4.) on the upper part of which is fixed a round globular copper-head, about five feet and a half in diameter, as L M N. There is then placed on the inſide a ſmall machine H, called the diſperſer, with ſpouts *a*, *b*, *c*, *d*, *e*, &c. round the ſides fixed to it, and the bottom thereof reſts on a center-pin O. In this machine is fixed an upright tube G, with holes at the bottom, and a funnel P on the top to receive a ſpout of water from a conduit-pipe Q, by the ſtop-cock R.

This veſſel being completed, two or more of them are placed in a reverbaratory arch for conveying the intenſe heat of a ſtrong fire, the flame of which encompaſſes the iron veſſels, and keeps them in a red heat during the time of their uſe; at which time the cog-wheel I, being turned by proper machines, whirls the diſperſer about with great velocity, and cauſes the water in it, by a centrifugal force, to fly through the ſpouts, againſt the ſides of the red-hot pots, which immediately convert the greateſt part thereof into vapour, or elaſtic ſteam, which is conveyed by a common pipe and cock to the barrel of the engine, to put the piſton in motion; and the waſte water is conveyed away at bottom, by means of a pipe at CD, with a valve at D to keep out the air.

Mr. Vouloüe's ENGINE, *invented for driving the Piles at Weſtminſter-Bridge.*

A (plate LI. *fig.* 1.) the great ſhaft on which are the great wheel and drum.

B The great wheel with cogs, that turns a trundle-head with a fly to prevent the horſes falling when the ram is diſcharched.

C The drum on which the great rope is wound.

D The follower, with a roller at one corner, in which are contained the tongs that take hold of the ram, and are faſtened to the other end of the great rope which paſſes over the pulley, near the upper end of the guides, between which the ram falls.

E The inclined planes which ſerve to open the tongs, and diſcharge the ram.

F The ſpiral barrel that is fixed to the drum, on which is wound a rope with a counterpoiſe, to hinder the follower from accelerating, when it falls down to take up the ram.

G The great bolt which locks the drum to the great wheel.

H The ſmall lever which has a weight fixed at one end, paſſes through the great ſhaft below the great wheel, and always tends to puſh the great wheel upwards, and locks the drum to the great wheel.

I The forcing-bar, which paſſes through the hollow axis of the great ſhaft, and bears upon the ſmall lever, and has near the upper end a catch, by which the crooked lever keeps it down.

K The great lever which preſſes down the forcing-bar and diſcharges the great bolt, at the time the long end is lifted up by the follower.

L The crooked lever, one end of which has a roller, which is preſſed upon by the great rope; the other end bears upon the catch of the forcing-bar, during the time the follower is deſcending.

M The ſpring that preſſes againſt the crooked

lever, and discharges it from the catch of the forcing-bar, as soon as the great rope slackens and gives liberty to the small lever to push up the bolt.

By the horse going round, the great rope is wound about the drum, and the ram is drawn up till the tongs come between the inclined planes, when they are opened, and the ram is discharged.

Immediately after the ram is discharged, the roller which is at one end of the follower, takes hold of the rope that is fastened to the long end of the great lever, and lifts it up; the other end presses down the forcing-bar, unlocks the drum, and the follower comes down by its own weight.

As soon as the follower touches the ram, the great rope slackens, and the spring M discharges the crooked lever from the catch of the forcing-bar, and gives liberty to the small lever to push up the great bolt, and to lock the drum to the great wheel, and the ram is drawn up again as before.

Weaving ENGINE, a machine which may be worked either by wind, water, or a boy or man turning a winch. It is composed of four principal parts; 1st. The serpent *a a* (plate LI. *fig.* 2.) 2d. The treddles *b b*. 3d. The clapper *c*: and 4thly, the arms *d d d d*.

The serpent is made like the ordinary crank, and by its revolution gives motion to all the moveable parts of the engine. The treddles differ in nothing from the treddles in the common loom, only as they are worked by cords. The clapper *c* is supported between two rails by a cord double twisted, which gives it a spring, and when drawn back by the quadrant of the serpent that hitches in the curved teeth *g g*, causes it to fly forwards with a vibratory motion, and so to beat up the cloth. The arms *d d d d*, and their manner of working, is as follows; *b* is the end of the trigger, to which a cord is fastened which passes through a pulley, and terminates at *i*; *k k* are the weights that draw back the arms; *l* is the hole in which one end of the beam turns; *m* is the web. Fig. 3. shews the manner of conveying the shuttle; N N is a hollow pipe slit underneath, through which the arm L M passes to and fro; O O O O are the supporters. The motion is formed thus: P Q is a kind of trigger, which, though unequally divided by its supporter R, is yet in equilibrio, the end P R being made to weigh exactly as much as R Q. To the end Q of this trigger is tied a cord, which passing through the pulley S, terminates at the extremity of the arm, and is fastened to the little button *m*. At the other extremity of the same arm, to wit, at I I, a cord is also tied, which by means of the slit underneath, passes through the pulley 2, and supports the weight 3. At the same end of the arm the box Z, about half the bigness of the shuttle, is fixed, which is enclosed between two little pieces of wood, having at one end of them two teeth Y Z, and at the other a small whalebone, or steel spring, which naturally enclines the teeth to close, and enter the niches on each side the shuttle, through holes in the box left for that purpose. Across the points I I there goes another cord, which passes through the pulley T, and carries the weight V. This arm thus disposed, goes and comes in the hollow pipe N N, in the following manner: one tooth of the serpent is so contrived as, in turning, to press down the end of the trigger P, and so causes the end Q to rise, which drawing in the cord fastened to the button *m*, makes the arm L M to advance forward; but when the tooth is passed by, then the weight 3, fastened as already said, draws it back again. When the arm is in its natural state, the two little pieces of wood enclose the shuttle by means of the whalebone spring, but when the arm in motion approaches to its opposite, then the cord tied across at I I, being a little too short, and the weight V, not being able to pass through the pulley T, the spring is by this means bent back, and the teeth opened to discharge the shuttle, which is immediately received, and grasped by the other arm, and so alternately.

Fig. 4. is the serpent; A A the handle; H H the teeth that press down the trigger; F F the quadrants that work the clapper, as is shewn in the plate; and E E are the elbows, to which the cords are fixed that raise and lower the treddles, as in a common loom.

Fig. 5. is the box, springs, pieces of wood, and teeth *b b*, that enclose the shuttle, represented as opened to discharge it.

Fig. 6. is the shuttle with its niches *a a*.

ENGINE *for raising Water by Horse*. Mr. Walter Churchman gives the following account (of one he invented) to the Royal Society:

1. In this engine the horses, or other animals, draw horizontally, in a straight line and at right angles, whereby they exert their utmost force; by which means, far greater power is gained from the strength of the horses, &c. than by their going round in a circle: for, by the twist and acuteness of the angles, they draw in towards the center, whereby they waste their power, and likewise shorten their levers; besides, their muscles and tendons from their hinder legs all along their sides to their necks are unequally strained, as the duty is hardest on one side, even though their walk be large: therefore, each of those inconveniences must be attended with pain to the animals when at work, and with a great loss of their strength.

2. A crank does not rise quite $\frac{1}{4}$ of its circle, neither do the regulators or rods, rise or fall perpendicular, but obliquely, whereby an oval figure is formed by the pistons motion in every cylinder, which occasions great friction and a waste of water, and every arm is continually varying in its power while working; as its lever is distant from the perpendicular line, and two of the arms (supposing it a qua-

Fig. 1. Horse Engine for Raising Water by Mr. Churchman.

Fig. 4.

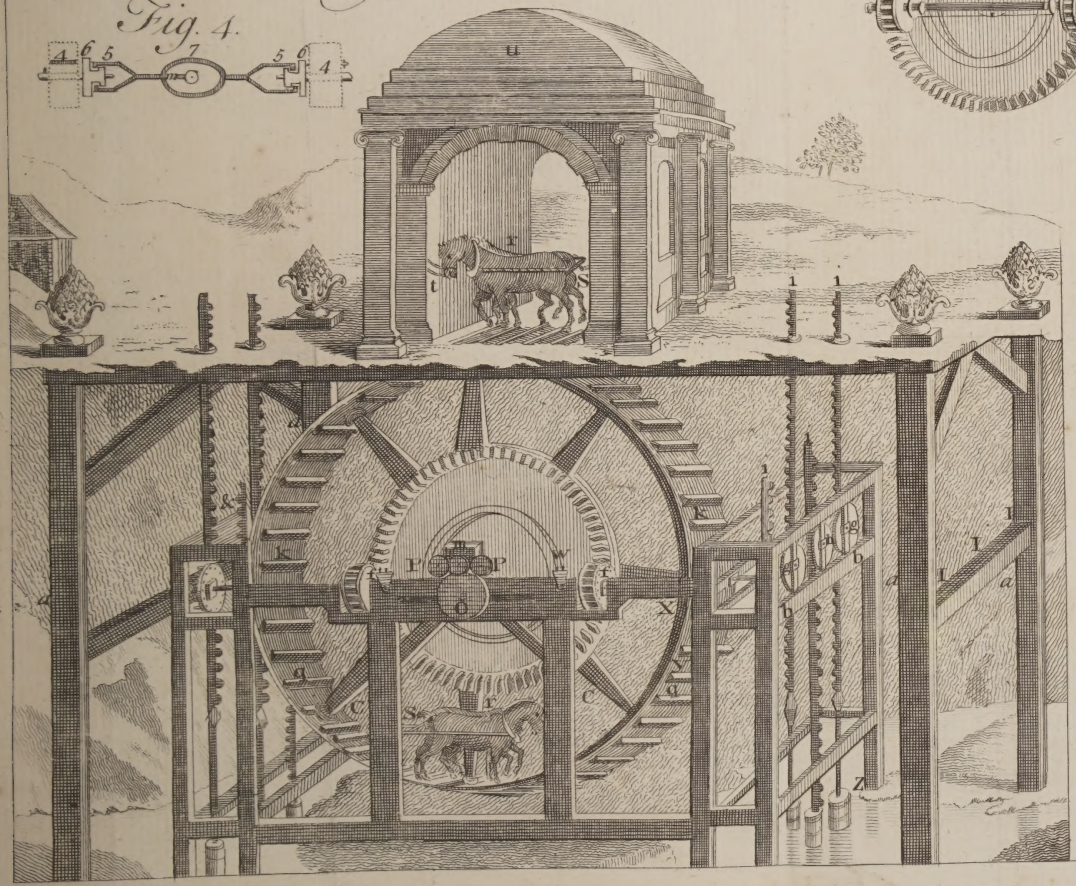


Fig. 3.

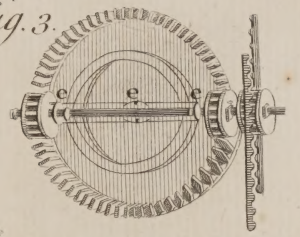
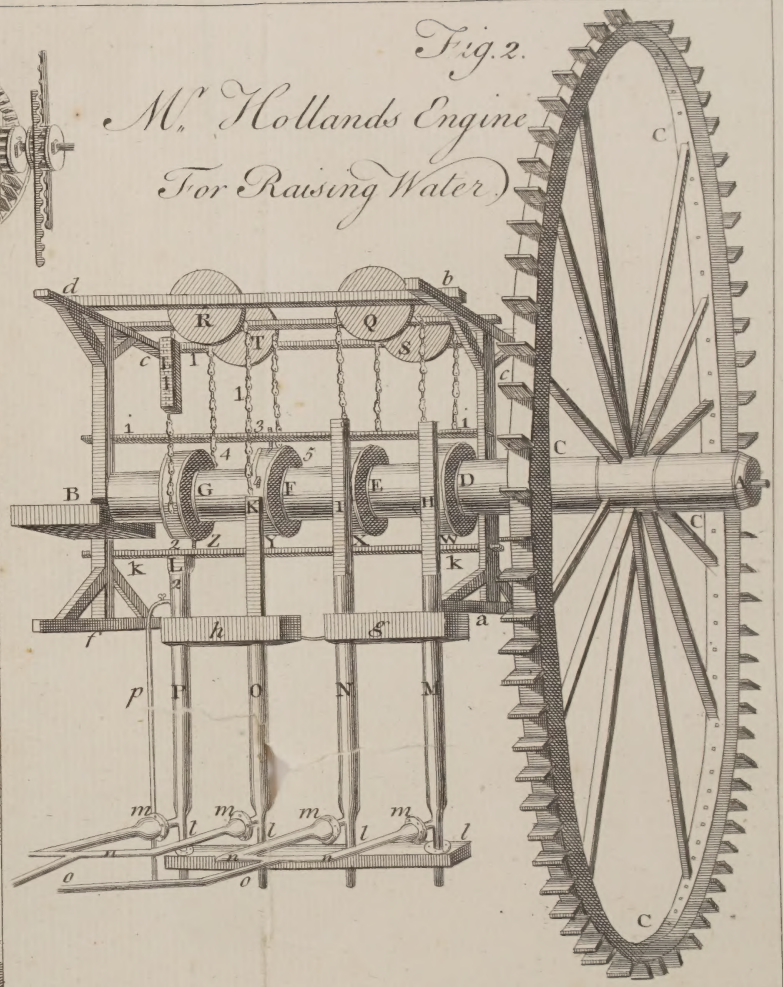


Fig. 2.

Mr. Hollands Engine For Raising Water.



J. Lodge sculp.

horſes, or when there is a ſufficient force of wind to do their whole duty; *w* the coupling ſtaples with the braſſes; *x* the ſtrong catch which confines the great wheel to the frame; *y* the ſcrew or kay-band, to confine all cloſe and tight; *z* the cylinders which are ſcrewed together at their ends out of ſight; and all the ſame ſort of work chiefly for uniformity in the draught.

In plate LII. *fig.* 2. you have a view of Mr. Holland's engine, at lord Tilney's, for raiſing water; the deſcription is as follows:

A B, the ſhaft or axle-tree of the engine, 24 feet long, and 24 inches diameter.

C C C C, an underſhot water-wheel, 30 feet diameter; its ladles 18 inches broad, and 12 deep; the fall ſeven feet.

D E F G, four moveable rings or collars, placed on the ſhaft, three feet diameter, ſix inches broad.

H I K L, four forcers, riſing and falling alternately, by means of thoſe collars, having four chains faſtened to the collars and the tops of the forcers, as repreſented at W X Y Z. The forcer L is cut off, to ſhew the chain more diſtinct. As the collar G moves (with the wheel and axis) half round towards you, the chain z, fixed at one end to the lower part of the collar G at 2, at its other end at the top of the forcer L 1, will pull down the forcer L 1 four feet and a half; and, at the ſame time, a chain l, fixed to the head of the forcer L 1, and to the head K, pulls up the forcer K four feet and a half; by which time the collar G will have carried its trigger 2 up to the bar *i i*, which will unlock its trigger; and the trigger 3, in the collar F, will be brought backward down to Y, and there lock the collar F. Then, the motion continuing, K will be depreſſed four feet and a half, and the chain I I, over the pulley R, will raiſe L four feet and a half. And thus the two forcers and collars continue riſing and falling, moving forwards and backwards, locking and unlocking alternately.

And, in like manner, the other two collars, D and E, move with their forcers, H and I.

But, to prevent one collar's moving the backward way, faſter than the other moves forwards, there is a gauge-chain 4, fixed to the collar G, paſſing over another pulley T, to the collar F at 5, which regulates their motions. Theſe chains are lengthened or ſhortened by ſcrews, as occaſion requires.

M N O P, are four braſs cylinders, or pumps, ſeven feet long; the bores of M and N are ſix inches diameter, and thoſe of O and P ſeven inches and one quarter; having, at *l l l l*, each a valve below, which are for taking in the water; and, at *m m m m*, valves in the horizontal parts.

The branches *m n*, *m n*, *m n*, *m n*, communicate the water of their two forcers by *n n*, *n n*, and ſo it to two pipes, *o n*. Theſe two pipes, *o n*, join together, at a ſmall diſtance beyond what is repreſented on the plate, ſo that the whole water is forced along one pipe; which makes a jet d'eau of ſeventy feet, and raiſes the water to the houſe above ſeventy feet perpendicular.

Ninety-five hogſheads are forced up, per hour, to the jet d'eau, and forty-ſeven to the garden.

g, *h*, are two ciſterns, ſupplied by a pipe *p*, to keep the forcers or piſtons always wet.

a b c d e f, is a frame of wood to carry the pullies Q R S T, and the bars *i i*, and *k k*.

The water-wheel goes about five times per minute to force the water to the houſe; and three, when the water is raiſed eighty feet to the gardens.

One turn of the wheel makes four ſtrokes, viz. each forcer one; A is ſix inches bore, and therefore holds

In 4½ feet	—	4.5 gallons
7¼	——	8.0
		12.5
		12.5
One revolution of the wheel	——	25.0
Times per minute		4
		100.0
		60 gallons per hour

63)6000.0(95.3 hogſheads per hour.

The half of which is 47.6 nearly.

The method of raiſing and falling the forcers in this engine is new, and finely contrived.

The locks and collars are ſo curiouſly formed, and the chains ſo nicely adjuſted, that there is little or no ſhock at the taking or leaving, which engines of this kind are too often ſubject to.

Self-moving ENGINE, a machine invented by a Poliſh Jeſuit; it conſiſts of a pump, whoſe body *a b f g* (plate LIII. *fig.* 1.) is a palm and two fingers breadth in diameter, and four palms in height; the head *d e f g* is a palm in height; the cylinder *a b d e* of the body of the pump is two palms and a half in height, of which the piſton *c c* fills up one palm; the other palm and half muſt hold at leaſt five cans of water, each containing three quarts.

The wooden pipe from *f g* to the horizontal pipe *n n* is about thirty-two palms in vertical height.

The author obſerves, that if the diameter of the mouth of the pipe *h n* be equal to that of the cavity of the pump, and the diameter of the iron rod *h k* be of ſuch ſize as that the pipe *f g n* ſhall contain only ſeventeen cans of water, the machine will be the eaſier worked, as the water being forced through a paſſage leſs ſtraight meets with leſs reſiſtance.

The diameter of the hole *f g* muſt be equal to half the diameter *d e* of the body of the pump, whence it will be four times ſtraighter than the body of the

Ellipse.

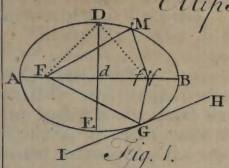


Fig. 1.

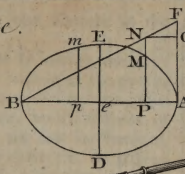
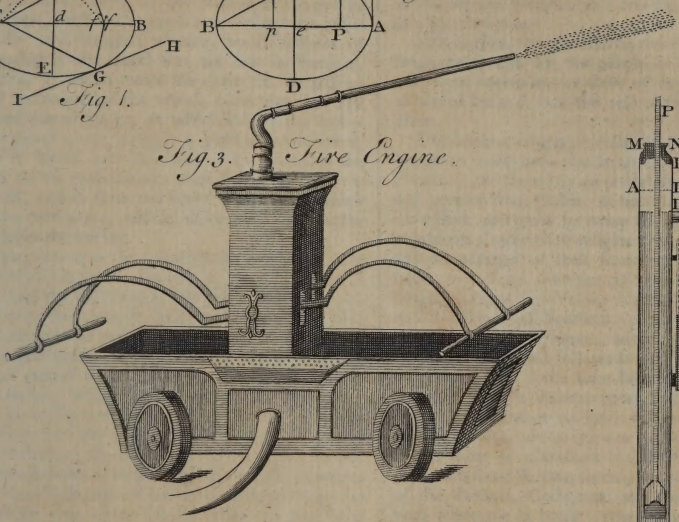


Fig. 2.

Fig. 3. Fire Engine.



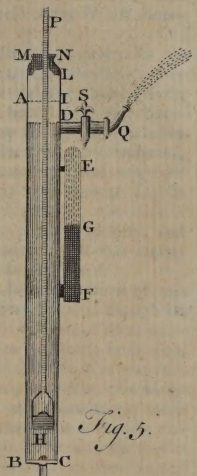
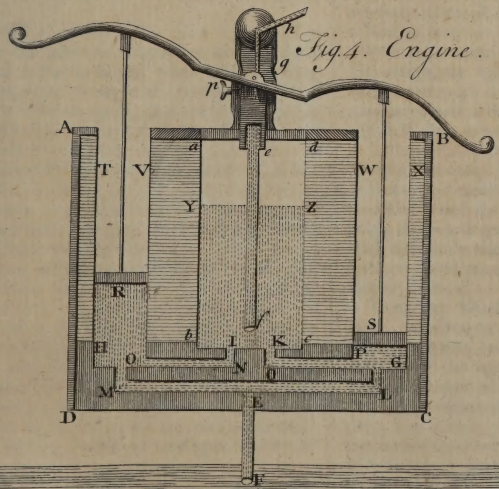


Fig. 5.

Engine.

Fig. 4. Engine.



pump, becauſe circles are to one another as the ſquares of their diameters.

The machine works in the following manner: The piſton *cc* being at the bottom of the pump, the ſuckers, both of the pump and of the piſton, ſhut by their own weight; whence, by the deſcent of the bucket *p*, the wheel *mm*, ſix feet in diameter, is turned, by which means the chain *kz*, by paſſing round the axis *ll* of the wheel, raiſes the iron rod *kh*, and the piſton *cc*, at which inſtant the ſucker of the pump opens, and gives paſſage to the water, which is forced into the body of the pump by the weight of the external air; then the counterpoiſe *v* deſcends, and ſo turns the wheel *mm*, round which goes the cord *mmo*, which, deſcending on the other ſide, raiſes the bucket.

In proportion as the counterpoiſe *v* deſcends, and the bucket *p* is raiſed, the axle of the great wheel is freed from the twiſtings of the cord, and ſo the piſton, by its own weight, and that of the iron rod, falls down to the bottom of the body of the pump, and by that means the ſucker of the pump ſhuts, and the five cans of water mount up through the piſton by its ſucker, which opens above. The ſame operation is readily performed again, in order to carry that water into the pipe *fgnni*, whence it is diſcharged through the horizontal pipe *nn* into the baſon, which holds at leaſt thirty-two pounds of water. This water falls into the bucket *p*, through the pipe *qr*, whoſe clap opens (being raiſed by two croſs ſticks which are faſtened to the cord) and lift up the bar *oy*.

The bucket *p* contains four cans and a half of water; it is two palms in length, ten at the opening, and ſix inches in depth, when the two long faces uniting, form an angle of 120 degrees; being thus filled, it deſcends apace, and the bar *no* being depreſſed, the clap falls and cloſes the pipe *qr*; and as it deſcends thirty feet, and the great wheel is ten feet in diameter, it makes an entire revolution; thus the axis *ll* twiſting up the chain *kz*, the rod *kh* raiſes anew the piſton *c*, and carries again at leaſt four cans and a half of water into the baſon *nq* through the horizontal pipe *nn*.

The bucket, when deſcended almoſt to the ſurface of the water of the well, is raiſed again by means of the cord *st* which is too ſhort to reach the water, and being for the preſent diſcharged of its weight, the piſton deſcends to the bottom of the pump by its own weight and that of the rod *hk*, and the croſs ſtick *so* of the cord of the bucket coming under the bar *oy*, raiſes it, together with the clap, that the water of the baſon *nq* may fall again thro' the pipe *qr* into the bucket *p*, cauſing it to deſcend anew, and ſo maintain a perpetual motion.

There are ſeveral other ſmall pieces in this engine, the uſe of which is eaſily comprehended by the figure.

ENGINEER, or ENGINEER, properly ſignifies one ſkilled in the nature of engines in general; but it is commonly applied to an officer who is appointed to inſpect and contrive any attacks, defences, &c. of a fortified place.

ENGLISH, or the ENGLISH-TONGUE, the language ſpoken by the people of England, and, with ſome variation, by thoſe of Scotland, as well as part of Ireland, and the reſt of the Britiſh dominions.

The ancient language of Britain is generally allowed to have been the ſame with the Gaulic, or French; this iſland, in all probability, having been firſt peopled from Gallia, as both Cæſar and Tacitus affirm, and prove by many ſtrong and concluſive arguments; as by their religion, manners, cuſtoms, and the nearneſs of their ſituation. But now we have very ſmall remains of the ancient Britiſh tongue, except in Wales, Cornwall, the iſlands and highlands of Scotland, part of Ireland, and ſome provinces of France; which will not appear ſtrange, when what follows is conſidered.

Julius Cæſar, ſome time before the birth of our Saviour, made a deſcent upon Britain, though he may be ſaid rather to have diſcovered than conquered it; but, about the year of Chriſt forty-five, in the time of Claudius, Aulus Plautius was ſent over with ſome Roman forces, by whom two kings of the Britons, Codigunus and Caractacus, were both overcome in battle: whereupon a Roman colony was planted at Malden in Eſſex, and the ſouthern parts of the iſland were reduced to the form of a Roman province: after that, the iſland was conquered as far north as the Firths of Dumbarton and Edinburgh, by Agricola, in the time of Domitian; whereupon a great number of the Britons, in the conquered part of the iſland, retired to the weſt part, called Wales, carrying their language with them.

The greateſt part of Britain being thus become a Roman province, the Roman legions, who reſided in Britain for above two hundred years, undoubtedly diſſeminated the Latin tongue; and the people being afterwards governed by laws written in Latin, muſt neceſſarily make a mixture of languages. This ſeems to have been the firſt mutation the language of Britain ſuffered.

Thus the Britiſh tongue continued, for ſome time, mixed with the provincial Latin, till, the Roman legions being called home, the Scots and Picts took the opportunity to attack and harraſs England: upon which, king Vortigern, about the year 440, called the Saxons to his aſſiſtance, who came over with ſeveral of their neighbours, and having repulſed the Scots and Picts, were rewarded for their ſervices with the iſle of Thanet, and the whole county of Kent: but growing too powerful, and not being contented with their allotment, diſpoſſeſſed the inhabitants of all the country on this ſide

of the ſevern: thus the Britiſh tongue was in a great meaſure deſtroyed, and the Saxon introduced in its ſtead.

In the beginning of the ninth century, the Danes invaded England, and getting a footing in the northern and eaſtern parts of the country, their power gradually increaſed, and they became ſole maſters of it in about two hundred years. By this means the ancient Britiſh obtained a tincture of the Daniſh language; but their government, being of no long continuance, did not make ſo great an alteration in the Anglo-Saxon, as the next revolution, when the whole land, in the year 1067, was ſubdued by William the Conqueror, duke of Normandy in France: for the Normans, as a monument of their conqueſt, endeavoured to make their language as generally received as their commands, and thereby rendered the Britiſh language an entire medley.

Thus was the ancient Britiſh language, in a manner, extirpated by the Romans, Danes, and Saxons, and ſucceeded by the Saxon, and after that blended with the Norman French. But, beſides theſe, a change in the language has been effected by two other cauſes. The firſt is that of commerce; for as the inhabitants of Great-Britain have been for a long ſeries of years greatly addicted to trade, the names of offices, dignities, names of wares, and terms of traffic, have been introduced, and formed according to the genius of our own tongue. The ſecond is that of learning, from which our tongue has received no ſmall improvement; for, as to the Greek and Latin, the learned have, together with the arts and ſciences, now rendered familiar among us, introduced abundance, nay almoſt all the terms of art in the mathematics, philoſophy, phyſic, and anatomy; and we have entertained many more from the Latin, French, &c. for the ſake of neatneſs and elegancy: ſo that, at this day, our language, which, about 1800 years ago, was the ancient Britiſh, or Welſh, &c. is now a mixture of Saxon, Teutonic, Dutch, Daniſh, Norman, and modern French, embelliſhed with Greek and Latin. Yet this, in our opinion, is ſo far from being a diſadvantage to the Engliſh tongue, as now ſpoke (for all languages have undergone changes, and do continually participate with each other) that it has ſo enriched it, as now to become the moſt copious, ſignificant, fluent, courteous, amorous, and maſculine language in Europe, if not in the world: this, indeed, was Camden's opinion of it in his time, and Dr. Heylin's in his time: if then the Engliſh tongue, in the opinion of theſe learned authors, deſerved ſuch a character in their days, how much more now, having ſince received ſo conſiderable improvements from ſo many celebrated writers.

ENGRAFTING, or GRAFTING, in gardening. See GRAFTING.

ENGRAILED, or INGRAILED, in heraldry, a term derived from the French, *greſly*, hail; and ſignifying a thing the hail has fallen upon and broke off the hedges, leaving them ragged, or with half rounds, or ſemi-circles, ſtruck out of their edges.

ENGRAVING, the art of cutting on wood, metals, precious ſtones, &c. figures, landſcapes, letters, &c.

ENGRAVING *on Wood*. See the article CUTTING *in Wood*.

ENGRAVING *on Copper*, the making, correſpondently to ſome delineated figure or deſign, ſuch concave lines, on a ſmooth ſurface of copper, either by cutting or corroſion, as render it capable, when charged properly with any coloured fluid, of imparting by compreſſion an exact repreſentation of the figure or deſign to any fit ground of paper or parchment.

The method by which engraving is at this time performed, is of three kinds: by the graver or tool alone, which is in common language the only kind called engraving: by corroſion with aqua-fortis, which is generally called etching: and by covering the ſurface of a copper-plate with lines, in ſuch manner, that the whole would produce the effect of black in an impreſſion; and then ſcraping or burniſhing away part of the lines, ſo as to cauſe the remainder to have the ſame effect as if they had been cut on the even ſurface, according to the delineation of any figure or deſign; which laſt kind is called ſcraping in mezzotinto. See ETCHING and MEZZOTINTO.

Engraving with the tool was the kind originally practiſed, and it is yet retained for many purpoſes. For though the manœuvre of etching be more eaſy, and other advantages attend it, yet where great regularity and exactneſs of the ſtroke or lines are required, the working with the graver is much more effectual; on which account it is more ſuitable to the preciſion neceſſary in the execution of portraits; as there every thing the moſt minute muſt be made out and expreſſed, according to the original ſubject, without any licence to the fancy of the deſigner in deviating from it, or varying the effect either by that maſterly negligence and ſimplicity in ſome parts, or thoſe bold ſallies of the imagination and hand in others, which give ſpirit and force to hiſtory painting.

ENGRAVING *on precious Stones*, is the repreſenting of figures, or devices, in relievo, or indented, on divers kinds of hard poliſhed ſtones.

In this branch of engraving, they make uſe either of the diamond, or emery.—The diamond, which is the hardeſt, and moſt perfect of all precious ſtones, is only cut by itſelf, or with its own matter. See DIAMOND.

As to rubies, emeralds, hyacinths, amethyſts, garnets, agats, and other of the ſofter ſtones, they are cut on a leaden wheel, moiſtened with emery and

and water; and polished with tripoli, on a pewter-wheel. Lapis, opal, &c. are polished on a wooden wheel.

To fashion and engrave vases of agat, crystal, lapis, or the like, they have a kind of lathe, like that of the pewterers, excepting, that whereas the latter is to hold the vessels which are to be wrought with proper tools; the former generally holds the tools, which are turned by a wheel, and the vessel held to them to be cut and engraved, either in relievo, or otherwise; remembering, from time to time, to moisten the tools with diamond dust and oil, or at least emery and water.

To engrave figures or devices on any of these stones, when polished, such as medals, seals, &c. they use a little iron wheel, the two ends of whose axes are received within two pieces of iron placed upright, as in the turner's lathe, to be brought closer, or set farther apart, at pleasure. At one end of one of the axes are fitted the proper tools, being kept tight by a screw. Lastly, the wheel is turned by the foot, and the stone applied by the hand to the tool; and thus shifted and conducted, as occasion requires.

The tools are generally of iron, sometimes of brass. As to their form it is various, but generally bears some resemblance to chissels, gouges, &c. some have small round heads like buttons, others like ferrels, to take the pieces out; others flat, &c. These tools are not applied directly against the stone, but, as it were, sidewise; thus wearing, and, as it were, grinding off the substance: and still, whether it be figures, or letters, or characters, the manner of application is the same. The tools, as above observed, are to be frequently moistened with diamond dust, and oil of olives. When the stone is engraven, they polish it on a wheel of brushes, made of hogs bristles, with tripoli. For the larger and less delicate works, they have copper or pewter tools on purpose to polish the ground, or plain parts, with tripoli, &c. which they apply after the same manner as those wherewith the graving is performed.

ENGRAVING *on Steel* is chiefly employed in cutting punches for coins, medals, &c.

The methods of engraving, with the instruments, &c. are the same for coins, as for medals and counters: all the difference consists in their greater or less relievo; the relievo of coins being much less considerable than that of medals; and that of counters still less than that of coins.

The engraver in steel usually begins with punches, or punchions, which are in relievo, and serve for making the creux, or cavities of the matrices, and dies. Though, sometimes, he begins immediately with the creux; but it is only when the intended work is to be cut very shallow. The first thing is to design his figures; then he moulds them in white wax, of the size and depth required; and from this wax he graves his punch.

This punch is a piece of steel, or at least of iron and steel mixed; on which, before they temper or harden it, the intended figure, whether a head, or a reverse, is cut, or carved in relievo. The instruments used in this graving in relievo, which are much the same as those wherewith the finishing of the work in creux is effected, are of steel. The principal are gravers of divers kinds, chissels, flatters, &c. When the punch is finished, they give it a very high temper, that it may the better bear the blows of the hammer, wherewith it is struck, to give the impression to the matrice.

What they call matrice, or matrix, is a piece of good steel of a cubic form, called also a die; whereon the relievo of the punch is struck in creux. It is called matrix, because, in the cavities or indentures thereof, the coins, or medals, seem formed, or generated, as animals are in the matrix of their mother. To soften this steel, that it may more easily take the impressions of the punch, they make it red hot; and, after striking the punch thereon in this state, they proceed to touch up or finish the strokes and lines, where, by reason of their fineness, or the too great relievo, they are any thing defective, with some of the tools abovementioned.

The figure thus finished, they proceed to engrave the rest of the medal, as the mouldings of the border, the engrailed ring, letters, &c. all which, particularly the letters and graining (or engrailment) are performed with little steel punches, well tempered and very sharp. And that, as they sometimes make use of punchions to engrave the creux of the matrix, so, on some occasions, they make use of the creux of the matrix to engrave the relievo of the punch.

To see and judge of the engraving in creux, divers means have been devised to take impressions therefrom as the work proceeds. Sometimes they make use of a composition of common wax, turpentine, and lamp black; which, always retaining its softness, easily takes the impression of the part of the graving it is applied to. But, this only serving to shew the work piece-meal, they have had recourse to other ways, to shew the whole figure. The first, by pouring melted lead on a piece of paper, and clapping the matrix thereon: the second, with melted sulphur, managed the same way: and the third, proper only where the graving is shallow, by laying a piece of soft paper on the graving, and over the paper a leaf of lead, when, giving two or three blows with a hammer on the lead, the paper takes the impression of the work.

When the matrix is quite finished, they temper it, rub it well with pumice-stone, and clean out the stone again with a hair-brush; and, lastly, polish it with oil and emery.

EN-

ENGUICHE, in heraldry, is ſaid of the great mouth of a hunting-horn, when its rim is of a different colour from that of the horn itſelf.

ENHARMONIC, in the ancient muſic, one of their genera or kinds of muſic, ſo called from its ſuperior excellence; though wherein it conſiſted, ſays Mr. Malcolm, is hard to ſay: it was allowed by all to be ſo very difficult, that few could ever practiſe it.

Others ſay, it is a ſpecies of muſic, the modulation whereof proceeds by intervals leſs than ſemitones; as the ſemitone minor, enharmonic dieſis, and third major.

ENIXUM, among chemiſts, a kind of neutral ſalt, generated of an acid and an alkali.

The ſal enixum of Paracelſus, is the caput mortuum of ſpirits of nitre with oil of vitriol, or what remains in the retort after the diſtillation of this ſpirit, being of a white colour, and pleaſing acid taſte.

ENMANCHE, in heraldry, is when lines are drawn from the center of the upper-edge of the chief to the ſides, to about half the breadth of the chief; ſignifying ſleeved, or reſembling a ſleeve, from the French *manche*.

ENNEAGON, in geometry, a figure conſiſting of nine angles, and as many ſides.

The word is derived from the Greek εννεα, nine, and γονια, an angle.

ENNEAHÆDRIA, in natural hiſtory, the name of a genus of ſpars.

The word is derived from the Greek εννεα, nine, and εδρα, a ſide.

The bodies of this genus are ſpars, compoſed of nine planes, in a triagonal column, terminated at each end by a triagonal pyramid.

ENNEANDRIA (from εννεα, nine, and ανηρ, male) the name of the ninth claſs in the Linnæan ſyſtem of botany, and comprehends thoſe plants whoſe flowers are hermaphrodite and furniſhed with nine ſtamina in each.

To this claſs belong the flowering ruſh, Braſilian-plumb, laurel, rhubarb, &c.

ENNERIS, in the naval architecture of the ancients, a galley or veſſel with nine tiers of oars. See the article GALLEY.

ENS, among metaphyſicians, denotes entity, being, or exiſtence: this the ſchools call *ens reale*, and *ens poſitivum*, to diſtinguiſh it from their *ens rationis*, which is only an imaginary thing, or exiſts only in the imagination.

ENS, among chemiſts, imports the power, virtue, and efficacy, which certain ſubſtances exert upon our bodies.

ENS VENERIS, the ſublimate of equal quantities of dulcified calx of vitriol, and the dried flowers of ſal ammoniac, a ſmall proportion of which turns a large one of the infuſion of galls black: it is red, ſaline, and aſtringent, and ſaid to be an excellent medicine in diſtempers ariſing from a weakneſs of the ſolids, as the rickets, and the like.

ENSIFORM, in general, ſomething reſembling a ſword; thus we find mention of enſiform leaves, enſiform cartillage, &c.

The word is compounded of the Latin, *enſis*, a ſword, and *forma*, reſemblance.

ENSIGN, in the military art, a banner, under which the ſoldiers are ranged, according to the different companies or parties they belong to.

ENSIGN is alſo the officer that carries the colours, being the loweſt commiſſioned officer in a company of foot, ſubordinate to the captain and lieutenant.

ENSIGN, in naval affairs, a ſort of banner or flag hoiſted on a pole called the enſign-ſtaff, over the ſtern of a ſhip.

It is uſed to diſtinguiſh the ſhips of different nations from one another, as alſo the different ſquadrons of a fleet from each other. See FLAG and SIGNAL.

ENTABLATURE, or ENTABLEMENT, in architecture, is that part of an order of a column, which is over the capital, and comprehends the architrave, frieze, and corniche.

The entablature is alſo called the trabeation, and ſeems borrowed from the Latin, *trabs*, a beam; though others derive it from *tabulatum*, a ceiling, becauſe the frieze is ſuppoſed to be formed by the ends of the joiſts which bear upon the architrave.

It is different in different orders; for, notwithſtanding it conſiſts of the three before-mentioned diviſions in all, yet theſe parts are made up of more or fewer particular members or ſubdiviſions, according as the order is more or leſs rich. Vignola makes the entablature a quarter of the height of the whole column in all the orders. In the Tuſcan and Doric, the architrave, frieze, and corniche, are all the ſame height. In the Ionic, Corinthian, and Compoſite, the whole entablature being of fifteen parts, five of theſe go the architrave, four to the frieze, and ſix to the corniche. See the articles TUSCAN, DORIC, &c.

ENTABLATURE, in maſonry, is uſed ſometimes to denote the laſt row of ſtones on the top of the wall of a building, on which the timber and covering reſt. This is often made to project beyond the naked of the wall, to carry off the rain.

ENTAIL, in law, is a free eſtate intailed; that is, abridged and limited to certain conditions preſcribed by the donor or grantor. See the articles FEE, RECOVERY, and TAIL.

ENTE, in heraldry, a method of marſhalling more frequent abroad than with us, and ſignifying grafted or ingrafted.

ENTELECHIA, εντελεχεια, a word uſed by Ariſtotle to expreſs the ſoul, and which, not accurring in any other author, has given the commentators upon that philoſopher great trouble to diſcover its true meaning.

ENTEROCELE, in ſurgery, is a kind of ſwelling, in which the inteſtine falls into the groin or ſcrotum.

The word is Greek, and derived from εντερον, an inteſtine, and κηλη, a hernia, tumour, or rupture.

ENTERO-EPIPLOCELE, in ſurgery, is a kind of rupture in which the inteſtines and omentum, or caul, fall down together into the ſcrotum.

The word is derived from the Greek εντερον, an inteſtine, and επιπλοον, the caul.

ENTERO-EPIPLOMPHALUS, in ſurgery, is a rupture cauſed by the inteſtine and caul falling down through the naval.

The word is formed from the Greek εντερον, a gut, επιπλοον, the caul, and ομφαλος, the navel.

This is a diſorder common to women with child.

ENTERO-HYDROMPHALUS, in ſurgery, is when the tumour is cauſed by the gut and water ſwelling out at the navel.

The word is formed from the Greek εντερον, a gut, υδωρ, water, and ομφαλος, the navel.

ENTEROLOGY, a treatiſe on the bowels, which generally includes the contents of the three cavities, the head, breaſt, and belly.

The word is Greek, and derived from εντερον, a gut, and λογος, a diſcourſe.

ENTERPLEADER, in law, ſignifies the diſcuſſing or trial of point, incidentally falling out, before the principal cauſe can be determined.

ENTERSOLE, in architecture, a kind of little ſtory, ſometimes called a mezanzine, contrived occaſionally at the top of the firſt ſtory, for the conveniency of a ward-robe, &c.

ENTERTAINMENT, in a theatrical ſenſe. See the article FARCE.

ENTHUSIASM, a tranſport of the mind, whereby it is led to think and imagine things in a ſublime, ſurpriſing, and yet probable manner.

The word is Greek, ενθουσιασμος, and derived from ενθουσιαζω, to be agitated with divine raptures.

ENTHUSIASM, in a religious ſenſe, implies a tranſport of the mind, whereby it fancies itſelf inſpired with ſome revelation, impulſe, &c. from heaven.

ENTHUSIAST, a perſon poſſeſſed with enthuſiaſm.

ENTHYMEME, ενθυμημα, among logicians, denotes a ſyllogiſm, perfect in mind, but imperfect in the expreſſion, by reaſon one of the propoſitions is ſuppreſſed, as being eaſily ſupplied by the underſtanding of thoſe with whom we diſcourſe: as for example, *Every man is mortal*; *therefore every king is mortal*; where the minor propoſition, *every king is a man*, is omitted, as being ſufficiently known.

There is a particular elegance in the enthymeme form of arguing, as leaving ſomewhat to the exerciſe and invention of the mind; for which reaſon it is very frequent, as well in common converſation, as in the moſt polite writers. It not only ſhortens diſcourſe, and adds a certain ſtrength and livelineſs to our reaſoning, but alſo gives the reader a pleaſure not unlike that the author himſelf feels in compoſing. By this means we are put upon exerting ourſelves, and ſeem to ſhare in the diſcovery of what is propoſed to us.

ENTIER, in the manege, a reſty horſe that not only refuſes to turn, but alſo reſiſts the hand.

ENTIERTY, or ENTIERTIE, among lawyers, implies the whole of a thing, in contradiſtinction to a moiety: thus a bond, damages, &c. are ſaid to be intire, when they cannot be apportioned.

ENTIRE TENANCY, in law, is when the ſole poſſeſſion is in one perſon, in contradiſtinction to ſeveral tenancy, which is a joint, or common poſſeſſion of two or more.

ENTITIVELY, and ENTIETY, among metaphyſicians. See ENS.

ENTOYER, in heraldry, denotes a border charged wholly with things without life: it ſeems to be a corruption of the French *entour*, round about.

ENTREPAS, in the manege, a broken pace or going that is neither walk nor trot, but has ſomewhat of an amble.

ENTROCHUS, in natural hiſtory, the name of a genus of foſſils, of a very regular figure and ſtructure, ſuppoſed, by many authors, to be lapides ſui generis, and ſtones in their native ſtate. They are, however, in reality, the foſſil remains of ſome marine animal, probably either of the echinus, or of the ſtar-fiſh kind, filled, like the foſſil ſpecies of the echini, with a plated ſpar.

ENTRY, in law, ſignifies taking poſſeſſion of lands or tenements, where a perſon has a right ſo to do. It is alſo uſed for a writ of poſſeſſion.

Bill of ENTRY, in commerce. See BILL.

ENVELOPE, in fortification, a work of earth, ſometimes in form of a ſimple parapet, and at others, like a ſmall rampart with a parapet; it is raiſed ſometimes on the ditch, and ſometimes beyond it.

Envelopes are often made to encloſe a weak ground, where that is practicable, with ſingle lines, to ſave the great charge of horn-works and tenails, or where there is not room for ſuch large works. Some give the name of fillon, counterguard, conſerve, and lunette, to envelopes raiſed in the moat.

ENVIRONNE, in heraldry, ſignifies ſurrounded with other things: thus, they ſay, a lion environné with ſo many bezants. See the article BEZANT.

ENUMERATION, an account of ſeveral things, in which mention is made of every particular article.

ENUMERATION, in rhetoric, a part of peroration, in which the orator, collecting the ſcattered heads of what has been delivered throughout the whole, makes a brief and artful relation, or recapitulation thereof.

ENVOY, a perſon deputed to negociate ſome affair with any foreign prince or ſtate.

ENURNY, in heraldry, is applied to a border charged with beaſts.

ENVY, in ethics, is defined to be an uneaſineſs of the mind, cauſed by the conſideration of a good we deſire, obtained by one we think leſs worthy of it than ourſelves. See the article PASSION.

EPACTS, in chronology, the exceſſes of the ſolar month above the lunar ſynodical month, or of the ſolar year above the lunar year of 12 ſynodical months.

The common lunar year of 12 ſynodical lunations conſiſts of but 354 days, 8 hours, 48 min. 57 ſec. whereas the ſolar or tropical year conſiſts of 365 days, 5 hours, 48 min. 57 ſec. it is plain therefore that the ſolar year exceeds the lunar by 10 days, 21 hours, 00 min. 19 ſec. and in the ſpace of about 33 years, the beginning of the lunar year will have moved through all the variety of ſeaſons, whence it is called the moveable lunar year; and this form of the year is at this time uſed by the Turks and Arabs.

Hence, as the Julian year is 365 days, 6 hours, and the lunar year, as above, only 354 days, 8 hours, 48 min. 57 ſec. the annual epact will be 10 days, $21^h\ 11'\ 22''$; that is, nearly 11 days. Conſequently, the epact of 2 years is 22 days; of 3 years, 33 days; or rather 3, ſince 30 days is an emboliſmic, or intercalary month.

Thus, the epact of 4 years is 14 days, and ſo of the reſt; and at the end of every 19th year, the epact becomes 30 or 0; conſequently the 20th year the epact is 11 again; and ſo the cycle of epacts expires with the golden number, or lunar cycle of 19 years, and begins again with the ſame.

Again, as the new moons are the ſame, that is, as they fall on the ſame day every 19 years, ſo the difference between the lunar and ſolar years is the ſame every 19 years: and becauſe the ſaid difference is always to be added to the lunar year, in order to adjuſt, or make it equal to the ſolar year, hence the ſaid difference reſpectively belonging to each year of the moon's cycle is called the epact of the ſaid year, that is, the number to be added to the ſaid year, to make it equal to the ſolar, the word being formed from the Greek *επαγω*, *induco*, *intercalo*.

Upon this mutual reſpect between the cycle of the moon, and the cycle of the epacts, is founded this rule for finding the epact belonging to any year of the moon's cycle. Multiply the year given of the moon's cycle into 11, and if the product be leſs than 30, it is the epact ſought; if the product be greater than 30, divide it by 30, and the remainder of the dividend is the epact according to the Julian account.

But as a ſynodical month or ſpace of time contained between the moon's parting from the ſun, at a conjunction. and returning to him again, is 29 days, 12 hours, 44 min. and 6 ſec. it follows, that 235 lunations are made in 6939 days, 16 hours, 43 min. 30 ſec. but in 19 Julian years are 6939 days, 18 hours; and, conſequently, the new moons, after 19 Julian years, will not return to the ſame hour of the day, but will happen 1 hour, 16 min. 30 ſec. ſooner.

And therefore, becauſe the new moons do not return at the ſame time of the day that they did 19 years before; but in 312 years they will anticipate one day; we muſt, in order to find the epact according to the Gregorian calender, make proper allowance for the anticipation ſince the Nicene council, which was held in 325.

To do this, divide the centuries of the propoſed year by 4; let the quotient be multiplied by 43, and the remainder by 17; to the ſum of theſe products add 86, and divide the whole by 25. Let the quotient (neglecting fractions) be ſubtracted from 11 times the prime or golden number, then will the remainder, rejecting thirties, be the epact required.

To find the epact until the year 1900, the following rule will ſerve:

Subtract 1 from the prime or golden number, multiply the remainder by 11, and, rejecting thirties as before, the remainder will give the epact.

Example. Let it be required to find the epact for the year 1765.

By the firſt rule

```
4) 17 ( 1
   4   17
   43
   172
    17
    86
25) 275 | 11
```

```
G N° = 18
       11
       18
       18
       198
        11
30) 187 | 6
    180
    ..7 = the epact.
```

By the ſecond rule

```
G N° = 18
        1
       17
       11
        17
       17
30) 187 | 6
    180
      7 — the epact as before.
```

EPANORTHOSIS, in rhetoric, a figure by which a perſon corrects, or ingeniouſly revokes, what he juſt before alledged, as being too weakly expreſſed, in order to add ſomething ſtronger and more conformable to the paſſion with which he is agitated.

EPARER, in the manege, ſignifies the flinging of a horſe, or his yerking and ſtriking with his hind legs. See YERK.

EPAULE, in fortification, denotes the ſhoulder of a baſtion, or the place where its face and flank meet, and form the angle called the angle of the ſhoulder. See the article BASTION.

EPAULEMENT, in fortification, a work raiſed to cover ſidewiſe, is either of earth, gabions, or faſcines, loaded with earth. The epaulements of the places of arms for the cavalry, at the entrance of the trenches, are generally of faſcines mixed with earth.

EPAULEMENT alſo denotes a maſs of earth, called, likewiſe, a ſquare orillon, from its figure, raiſed to cover the cannon of a cazemate, and faced with a wall.

It is likewiſe uſed for any work, thrown up to defend the flank of a poſt, or other place.

EPEMBOLE, in rhetoric, the ſame with parembole. See the article PAREMBOLE.

EPENTHESIS, in grammar, the interpoſition or inſertion of a letter or ſyllable in the middle of a word, as *alituum*, for *alitum*; *relligio*, for *religio*; *induperator*, for *imperator*, *&c.*

EPHA, or EPHAH, in Jewiſh antiquity, a meaſure for things dry, containing 1.0961 of a buſhel. See MEASURE.

EPHEDRA, ſea-horſe-tail, in botany, a low ſhrubby plant, which ſends forth a few ſhort branches, riſing about two feet high, with many protuberant joints, from whence come out ſeveral narrow ruſhy leaves, which continue green throughout the year. It is of the dicœcia claſs, bearing male and female flowers on different plants; the male are amentaceous, deſtitute of a corolla, but the peranthium contains ſeven ſtamina, coaleſing in a ſubulated column; the female flower is alſo apetalous, but conſiſts of a quintuplex calyx, with two ovated germina, which afterwards becomes two baccated ſeeds acutely oval, convex on one ſide and plain on the other.

EPHEMERA, in medicine, the name of a ſpecies of fever, continuing the ſpace of one day, or ſometimes more; for the medical writers expreſs themſelves by *ephemera ſimplex*, *vel plurium dierum*.

This ſpecies of fever has this peculiar to it, that the pulſe is at firſt large, but as it becomes afterwards moderately quick and frequent, ſo it is equal, ſoft, and regular, as in a natural ſtate. The urine undergoes little or no charge, nor is the diſorder preceded by a loathing of food, a ſpontaneous laſſitude of the body, diſturbed ſleep, preternatural yawning, or horror; but it ſeizes the patient ſuddenly, and afflicts him with no other ſymptoms than a pain of the head and ſtomach, a nauſea, heat, and reſtleſſneſs. The perſons moſt ſubject to this fever, are young men who have much blood, and feed heartily, and ſuch as have had any habitual diſcharge of blood ſtopped upon them, whether natural, as in the hæmorrhoidal or menſtrual diſcharges, or artificial, ſuch as frequent bleeding, cupping, and the like; and thoſe who have thrown their blood into violent emotions by the too free uſe of ſpirituous liquors, too violent exerciſe, unuſual watchings, long ſtay by large fires, a ſudden repreſſion of ſweats by cold water, or by violent paſſions, particularly anger. In the treatment of this fever, the proper courſe is to attemperate the violent motions of the blood with nitrous and the fixed antimonial medicines, and occaſionally with gentle acids. Sweat is to be promoted. Nitre, crabs-eyes, &c. may be preſcribed in ſmall doſes every three or four hours; and towards night, ſodorifics ſhould be joined to theſe, ſuch as the contrayerva-root, or the like. The ephemera, properly ſo called, differs in nothing, except the time of its duration, from that which commonly laſts four days.

EPHEMERA MALIGNA is alſo a term by which ſome authors have called the ſudor anglicanus, or malignant diary fever, which generally deſtroyed the patient in twenty-four hours. See the article SUDOR ANGLICANUS.

EPHEMERA, the day-fly, in zoology, a genus of flies belonging to the neuroptera order, and ſo called from their living only one day and a night: they are about the ſize of the leſſer houſe-flies, and have two gibbous protuberances on the top of the head, reſembling eyes; add to this, that the tail is furniſhed with hairs, and the antennæ are ſhort.

Of this genus there are ſeveral ſpecies, diſtinguiſhed by their different colours, and the number of hairs in their tail; ſome have two, and others three.

EPHEMERIDES, in aſtronomy and chronology, an appellation given to ſuch books that contain the longitudes and latitudes of the planets, their paſſages over the meridian, and their declination; their conjunction among themſelves, and with the fixt ſtars; the occultations of the principal fixt ſtars by the moon; the eclipſes of Jupiter's ſatellites, and, in general, all the calculations which are neceſſary for a knowledge of the actual ſtate of the heavens, and for facilitating aſtronomical obſervations.

In France there are ſeveral ephemerides publiſhed, but thoſe calculated by De la Caille and De la Land are in the greateſt eſteem, and moſtly uſed by aſtronomers in England, being the beſt that have appeared of the kind in any nation. However, in

a ſhort time, we may expect to ſee one far ſuperior to theſe, which will be publiſhed in England for the year 1767.

The honourable commiſſioners of the Board of Longitude, from various reports that have been made to them by perſons well ſkilled in navigation and aſtronomy, of the great uſefulneſs of ſuch a book, have taken it into conſideration, and have come to a reſolution to employ five perſons, at the government's expence, to calculate a nautical ephemerides for the uſe of ſailors in general, and by which (with the help of the general table, diſcovered and now making by Mr. Witchell) they may with eaſe determine the longitude of a ſhip at ſea by only obſerving the diſtance of the moon from a fixt ſtar, or from the ſun, with a Hadley's quadrant.

EPHIPPUIM, in anatomy, the ſame with the cella turcica, being a part of the os ſphenoides. See the article SPHENOIDES.

EPHOD, in Jewiſh antiquity, one part of the prieſtly habit; being a kind of girdle which, brought from behind the neck over the two ſhoulders, and hanging down before, was put croſs the ſtomach, then carried round the waiſt, and made uſe of as a girdle to the tunic.

There were two ſorts of ephods, one of plain linen for the prieſts, and the other embroidered for the high-prieſt: of this laſt Moſes gives an ample deſcription. It was compoſed of gold, blue, purple, crimſon, and twiſted cotton. Upon part of it, which paſſed over the ſhoulders, were two large precious ſtones, one on each ſhoulder: upon theſe were engraven the names of the twelve tribes, ſix upon each ſtone.

The ephod was peculiar to the prieſthood, and thought eſſential to their character; it being the opinion of the Jews, that no worſhip, true or falſe, could ſubſiſt without a prieſthood and ephod.

EPHORI, εφοροι, in Grecian antiquity, magiſtrates eſtabliſhed in ancient Sparta to balance the regal power.

EPIC, or HEROIC POEM, a diſcourſe formed upon a ſtory partly real and partly feigned, repreſenting ſome glorious and fortunate action, that is diſtinguiſhed by a variety of wonderful, yet probable and pleaſing events, and delivered in verſe by way of narration, in a ſublime and flowing ſtile; to form the manners, and inflame the mind with the love of virtue.

What diſtinguiſhes an epic from a dramatic poem, is, its being a narration that comes immediately from the poet, and is not repreſented as a tragedy by perſons introduced for that purpoſe.

The chief things to be conſidered in an epic poem are, firſt, the fable, that is, the form, and artful repreſentation of the action, which is the matter of the poem; and as the action is more or leſs perfect, ſo is the fable. The action in an epic poem, as well as in tragedy, muſt be one, not all the actions of a perſon's life; becauſe the mind is better ſatisfied with the contemplation of a ſingle object that is eaſily underſtood, than when it is perplexed with a variety, and loſt in confuſion. And on this principal action muſt all the epiſodes or under-actions ſo depend, as to become different, yet uſeful, members of the ſame body, and contribute to its ſupport. It muſt likewiſe be entire, that is, complete in all its parts, or, as Ariſtotle deſcribes it, have a beginning, a middle, and an end. Nothing ſhould go before, be intermixed with, or follow after this main action, but what is related to it: nor ſhould any ſingle ſtep be omitted in that juſt and regular proceſs, which it muſt be ſuppoſed to take from its origin to its conſummation. The epic action ought alſo to be great, that it may ſtrike us with awe, and be ſuitable to the dignity of the princes, heroes, and illuſtrious perſons, who are ſuppoſed to be ſpeaking and acting in the poem. It ſhould likewiſe be intereſting, that it may engage our paſſions and affections; and entire, that the mind may be wholly ſatisfied. As to its duration, it is not circumſcribed within any limited time; but the warmer and more violent the action is, the ſhorter muſt be its continuance. Thus the Iliad, whoſe ſubject is the anger of Achilles, contains only forty-ſeven days: but the Æneid, whoſe hero is of a quite different character, takes up a much longer time.

The manners and ſentiments fall under the ſame rule as thoſe of tragedy: and as to the diction, it ought to be perſpicuous, but at the ſame time figurative, noble, and ſublime. See TRAGEDY.

The moderns ſeem to miſtake that part of the epic and tragedy which contain the wonderful, confounding it with improbable, and uſing the two words promiſcuouſly. If it was really ſo, the wonderful would be always faulty; for that is always ſo which is improbable. The great art is a juſt temperament and mixture of both, to make it natural and probable. Scarce any of the poets but Virgil had the art, by the preparation of incidents, to manage the probability in all the circumſtances of an epic poem. Homer is not altogether ſo ſcrupulous and regular in his contrivances: his machines are leſs juſt, and all his meaſures, to ſave the probility, are leſs exact. Laſtly, the ſovereign perfection of an epic poem, in the opinion of Ariſtotle, conſiſts in the juſt proportion and perfect connection of all the parts. It is not ſufficient that all be grand and magnificent in an epic poem, but all muſt be juſt, uniform, and proportionable, in the different parts that compoſe it.

This is all that can be obſerved moſt eſſential to an epic poem: little need be ſaid about the machinery, which, among the ancient heathens, was the agency of their falſe gods, and of angels and dæmons among us chriſtians: its beauty and magnificence is well known. The dignity of an epic poem would ſcarce be kept up without it, eſpecially ſince the

the marvellous depends on it. The verſification of epic poetry, among the Greeks and Romans, conſiſted of hexameters, a ſort of verſe ſo peculiar to the epic, that when it is uſed upon other occaſions, it is called heroic verſe. Our Engliſh verſe comes neareſt to it both in gvity and majeſty, but at how great a diſtance? ſee the article HEXAMETER.

An epic or heroic poem is the beſt and moſt perfect kind of poetry; it is the greateſt work which the ſoul of man is capable of performing; and here it is the utmoſt bounds are ſet to human compoſition. All the nobleneſs and the elevation of the moſt perfect genius can hardly ſuffice to form ſuch a one as is requiſite for an heroic poet: the difficulty of finding together fancy and judgment, heat of imagination and ſobriety of reaſon, precipitation of ſpirit and ſolidity of mind, renders the character ſo very rare: it requires great images, and yet a greater wit to form them. There muſt be a judgment ſo ſolid, a diſcernment ſo exquiſite, ſuch perfect knowledge of the language in which he writes, ſuch obſtinate ſtudy, profound meditations, and vaſt capacity, that ſcarce whole ages can produce one genius fit for an epic poet: even among the ancients themſelves, if we except Homer and Virgil, we ſhall ſcarce find one that is truly an epic poet.

EPICARPIUM, in ancient pharmacy, denotes a remedy applied in form of a plaſter to the wriſts: it conſiſted of penetrating ingredients, as garlic, onion, camphor, &c.

EPICEDIUM, επικηδιον, in ancient poetry, a poem rehearſed during the funeral ſolemnity of perſons of diſtinction. See the article NENIA.

EPICERASTICA, επικηραστικα from κεραννυμι, to mix or attemperate. Medicines which attemperate or obtund the acrimony of the humours, and mitigate the uneaſy ſenſation of the parts thence ariſing.

EPICHIREMA, επιχειρημα, in logic, a mode of reaſoning, which comprehends the proof of one or both the premiſes of a ſyllogiſm, before the concluſion is drawn.

EPICOENE, in grammar, a term applied to nouns, under the ſame gender and termination, mark indifferently the male and female ſpecies.

EPICUREAN PHILOSOPHY, the doctrine or ſyſtem of philoſophy maintained by Epicurus and his followers.

Epicurus, the Athenian, one of the greateſt philoſophers of his age, was obliged to Democritus for almoſt his whole ſyſtem, notwithſtanding he piqued himſelf upon deriving every thing from his own fund. He wrote a great number of books, which are made to amount to above 300. Though none of them are come down to us, no ancient philoſopher's ſyſtem is better known than his, for which we are moſt indebted to the great Lucretius, Diogenes Laertius, and Tully.

His philoſophy conſiſted of three parts, canonical, phyſical, and etherial. The firſt was about the canons, or rules of judging. The cenſure which Tully paſſes upon him for his deſpiſing logic, will hold true only with regard to the logic of the ſtoics, which he could not approve of, as being too full of nicety and quirk. Epicurus was not acquainted with the analytical method of diviſion and argumentation, nor was he ſo curious in modes and formation as the ſtoics. Soundneſs and ſimplicity of ſenſe, aſſiſted with ſome natural reflections, was all his art. His ſearch after truth proceeded only by the ſenſes, to the evidence of which he gave ſo great a certainty, that he conſidered them as an infallible rule of truth, and termed them the firſt natural light of mankind.

In the ſecond part of his philoſophy, he laid down atoms, ſpace, and gravity, as the firſt principles of all things: he did not deny the exiſtence of a God, but thought it beneath his majeſty to concern himſelf with human affairs: he held him a bleſſed, immortal being, having no affairs of his own to take care of, and above meddling with thoſe of others. See ATOMICAL PHILOSOPHY.

As to his ethics, he made the ſupreme good of man to conſiſt in pleaſure, and conſequently ſupreme evil in pain. Nature itſelf, ſays he, teaches us this truth, and prompts us from our birth to procure whatever gives us pleaſure, and avoid what gives us pain. To this end he propoſes a remedy againſt the ſharpneſs of pain: this was to divert the mind from it, by turning our whole attention upon the pleaſures we have formerly enjoyed: he held that the wiſe man muſt be happy, as long as he is wiſe; that pain, not depriving him of his wiſdom, cannot deprive him of his happineſs.

There is nothing that has a fairer ſhew of honeſty than the moral doctrine of Epicurus. Gaſſendus pretends, that the pleaſure in which this philoſopher has fixed the ſovereign good, was nothing elſe but the higheſt tranquility of mind in conjunction with the moſt perfect health of body: but Tully, Horace, and Plutarch, as well as almoſt all the fathers of the church, give us a very different repreſentation: indeed the nature of this pleaſure, in which the chief happineſs is ſuppoſed to be ſeated, is a grand problem in the morals of Epicurus. Hence there were two kinds of Epicureans, the rigid and the remiſs: the firſt were thoſe who underſtood Epicurus's notion of pleaſure in the beſt ſenſe, and placed all their happineſs in the pure pleaſures of the mind, reſulting from the practice of virtue. The looſe or remiſs Epicureans, taking the words of that philoſopher in a groſs ſenſe, placed all their happineſs in bodily pleaſures, or debauchery. Thus we have the whole myſtery of this celebrated doctrine. It was innocent in expreſſion, but criminal in thought; it had a beautiful outſide, but it was all corruption within. Theſe looſe philoſophers

took up a seeming austerity to disguise their secret indulgence, and all their schemes of morality were but so many veils for their immoral behaviour.

EPICYCLE, is a small circle whose center is in the circumference of a greater or a small orb, which being fixed in the large orb of a planet, is carried along with its motion, and yet by its own peculiar motion carries the body of the planet round its proper axis. The epicycle was of great use in the Ptolemaic astronomy for solving the different phases and phænomena that happen among the planets, but it is quite omitted in the copernican system.

EPICYCLOID, is a curve generated by a point taken in the periphery of a circle that rolls or revolves upon the periphery of another circle either within or without.

Case I. If the circle ABC remains immoveable while AMDP (plate LIII. *fig.* 2.) runs on its circumference, then every epicycloid, as A *e* Q *g h*, is called simple or ordinary, and its following properties are evident.

1°. Let the velocities of that circle be ever so unequal, the arc AB (which call the base of the epicycloid) is equal to the circumference AMDP.

2°. If the arc OI, similar to the arc AB, be divided into four equal parts, at the points E, F, G, the center O will have come to the point E, when the point A has described a fourth part of its track in returning to the circle ABC: the same happens at the points F, G, I, where the center of the circle AMDP is found at the end of each fourth part of its return to the circumference ABC. Therefore, if through the pipe F be drawn a radius prolonged, it will give the point Q for the vertex of the epicycloid; and the part QT of this radius will be its axis, which is equal to the diameter of the circle AMDP. And if from the point E as a center, with a radius equal to OA, an arc of a circle be described towards O, it meets the epicycloid in the point *e*, where the point A was when the center O was in E. In the same manner the point A will also be found to have been in *g*, when the center was in G; whence it follows, that the arc A *e* was described while the point A retrograded in describing a part of its inferior semi-circle; and the arc *e* Q *g* was described while the point A described its upper semi-circle with a direct motion: lastly, the arc *g* B was described while the point A retrograded in the other part of its inferior semi-circle.

3°. The epicycloid is bisected in the vertex Q; and the legs Q *e* A, Q *g* B, of the curve are equal, and similarly posited with respect to the axis TQ.

4°. The arcs A *e*, *g* B, bend towards the axis TQ; because the retrograde motion of the point A carries them in that direction: but they do not return into themselves, as in *fig.* 3, because the path OI of the center A being in every revolution greater than the arc AB, which is equal to the circumference AMDP, the motion of that center in the direction OI draws the point A towards K, more than its retrgade motion about the center O carries it an opsite direction.

5°. The describing point A, in passing from the leg Q *g* B to the leg BK of the next epicycloid, makes an angle at B: for the point describing the last leg of the epicycloid A Q B, the instant it comes to B, immediately rises again into the first leg of the other epicloid BKC, and describes no space between the legs.

6°. The point A viewed from S, appears always direct, but the velocity seems to accelerate all along the leg A Q, to be greatest at the vertex Q, and then to diminish along the leg Q *g* B, so as to become nothing in the point B; then again it accelerates in the leg BK.

Case II. If, while the circle AMDP rolls on ABC, the latter should also turn on its center S, in the same direction ABC: (*fig.* 4.) or in general, if the center of the circle AMPD advances in the circle CFI, with a greater velocity than the point A has in revolving in the circle AMPD; then the epicycloid described during the revolution of the point A, would be lengthened; and evidently have the following properties:

1°. Since all the points of a simple epicycloid would advance towards C, although the circle ABC was at rest; then, if ABC advances also in the same direction, the velocity of the describing point must be greater in that direction, and consequently make those spaces longer; so that the base AB of the epicycloid must be equal to the sum of the circumference AMDP, and that arc the circle ABC has described during a return.

2°. If the motions of the two circles are uniform, the points E, F, G, dividing OI into four equal parts, will determine, as above, the epicycloidal arcs A *e*, *e* Q, Q *g*, *g* B, answering to the motion of the point A in the inferior and superior parts of its circle; the axis TQ will be equal to the diameter AD, and the legs Q *e* A, Q *g* B, are equal, and similarly posited in respect to the axis.

3°. The greater the velocity of the circle ABC, the less the arcs A *e*, *g* B, bend towards TQ.

4°. The describing point does not form an angle in passing from the leg Q *g* B into the leg BK, but makes a curve in B, which is more obtuse as the velocity of the circle ABC is greater: for this velocity makes the point A descend more obliquely along the leg Q *g* B; and when arrived at B, makes it describe a small space on ACB, before it ascends into the leg BK, so that the passage is through a curve *g* BK.

5°. The point A viewed from the point S, is always direct; and its velocity accelerates from A to Q; then diminishes from Q to B; where it appears to be nothing, or only equal to the velocity of the circle ABC.

Case III. If, during the time of the return of A to

to the circle ABC, this circle ſhould alſo turn on its center in an oppoſite direction; or in general, if the center of the circle AMPD advances in the circle OFI, with leſs velocity than that wherewith the point A moves in the circle AMDP; then the epicycloid would become ſhortened. This caſe might be ſubdivided into ſeveral others, but not to make this theory needleſsly complex, let only the retrograde velocity of the circle ABC be ſuppoſed leſs than that of the point A in its circle AMDP. Now on this hypotheſis,

1°. If the circle ABC (*fig.* 3.) had remained immoveable, none of the points of the epicycloid would have retrograded; but as ABC retrogrades, its motion muſt augment the velocity of the point A in the inferior ſemi-circle where it retrogrades, and diminiſh it in the upper ſemi-circle where it is direct. Hence it follows, that the extent of the epicycloid will be diminiſhed in the direction ABC, its baſis becoming equal to the difference between the circumference of the circle AMDP, and the arc which the circle ABC has deſcribed during the return of the point A.

2°. Theſe two motions being uniform, the arcs A*e*, *e*Q, Q*g*, *g*B, will, as above, be found anſwering to the upper and inferior parts of the circle AMDP; the axis TQ=AD, and the legs Q*e*A, Q*g*B, equal and in ſimilar poſitions in reſpect of the axis TQ.

3°. The arcs A*e*, *g*B, anſwering to the retrograde motion of the point A, are more curved towards the axis TQ, in proportion as the velocity of the circle ABC is greater; and at the point B the arc muſt turn inwards; becauſe then the point A moves contrary to the tendency towards C, by the ſum of both motions.

4°. The paſſage of the point A through the point B is made by a curve *g*B*m*, returning towards itſelf: for when the point A has deſcribed the leg Q*g*B, and arrives at B, the retrograde velocity of the circle ABC cauſes it to deſcribe a ſmall ſpace before the point A aſcends by the leg B*m*K.

5°. The point A viewed from the point S, appears ſometimes direct, ſometimes retrograde, and ſometimes immoveable, or ſtationary. For the tangents S*m*, S*n*, S*t*, S*y*, being drawn from the point S, ſhew that the point A appears direct in deſcribing the arc *n*Q*g*t, all the points of that arc being directed towards C: when the point A is in the tangent S*t*, it muſt appear ſtationary, that is, tending neither towards C nor O, during the time of deſcribing the arc of the curve which coincides with the tangent: afterwards the point A ſeems retrograding in the arc *t*B*m*, that is, in the arc comprehended between the two tangents; and in the point *m* it again ſeems ſtationary: laſtly, it appears direct in the arc *m*K*y*, till it becomes ſtationary in *y*; then retrogrades as before, and ſo on. Therefore the point A during every revolution in its circle, appears twice ſtationary, once direct, and twice retrograde.

6°. The velocity of the point A muſt appear equal to nothing in the ſtationary points; then it appears accelerated until A comes to the vertex of the curve, where the velocity ſeems greateſt; becauſe the arcs then deſcribed are directly expoſed to the eye; then it diminiſhes from theſe points to the next ſtationary point.

7°. The greater the velocity of the circle ABC, the greater is the arc of retrogradation *t*B*m*.

Corol. Therefore in theſe ſorts of motions, the nature of the epicycloid generally depends on the relation of its baſe AB to the circumference of the circle where the deſcribing point is.

Schol. If, in the ſecond and third caſes, the motion of theſe circles had not been uniform, the epicycloid would then have been leſs regular, and the axis TQ not in the middle between the legs Q*e*A, Q*g*B; nor the legs equal or in like poſitions; one would be longer than the other, according as the combination of the velocities urged more on one ſide than on the other: but the epicycloid would retain nearly the ſame figure; that is, it would always have a curvature towards B, diſpoſed in the ſame manner as in *fig.* 3 and 4.

From this general theory ſuch concluſions may be drawn as are applicable to the phænomena of the motions of the planets, according to the order in which they are ranged in the ſolar ſyſtem.

EPIDEMIA, επιδημια, in Grecian antiquity, feſtivals kept in honour of Apollo and Diana, at the ſtated ſeaſons when theſe deities, who could not be preſent every where, were ſuppoſed to viſit different places, in order to receive the vows of their adorers.

The feſtival took its name epidemia, from επι, among, and δημος, people; on account of the imaginary preſence of thoſe deities among the people.

EPIDEMIA is alſo uſed for the private feaſts, or rejoicings, on account of the ſafe return of a friend from a voyage or journey.

EPIDEMIC, among phyſicians, an epithet of diſeaſes, which, at certain times, are popular; attacking great numbers at or near the ſame time.

EPIDEMIC diſeaſes differ from thoſe called endemic. See the article ENDEMIC.

We muſt remark, ſays the celebrated Boerhaave, that though every particular diſeaſe of the fluids, in various epidemical conſtitutions, appear, to inattentive obſervers, the ſame with regard to their names, ſigns, and their conſequences in ſome meaſure, yet the ſame diſeaſes, appearing in one epidemical conſtitution, differ exceedingly from thoſe produced in another, with reſpect to their obſcure natures; their appearances not obſervable, except by the judicious; the various times of their increaſe, ſtate, coction, criſis, effect, event, and method to be purſued for the cure. Hence it is evident, that they require a different adminiſtration of the non-

naturals

naturals, different treatment and medicines: this variety, however, in epidemical diſtempers, is ſo obſcure, that phyſicians have not yet been able to deduce it from any abuſe of the non-naturals: and yet there are many circumſtances which make it highly probable, that the cauſes reſide in the air, but depend more upon the inexplicable variety of exhalations contained therein, which, by their mixture with the fluids of the body, or their ſtimulus, injure the human machine, than upon any change in the ſenſible qualities thereof. But it is very ſurpriſing, that theſe epidemical diſorders ſhould be principally propagated by contagion, received from one by another perſon unaffected.

Upon the invaſion of any unknown epidemical diſtemper, the phyſician will receive ſome information with reſpect to the cure, firſt, by reducing the diſtemper to ſome more known ſpecies, which it moſt reſembles.

Secondly, by obſerving its tendency at the vernal and autumnal equinoxes, at which ſeaſon it is generally moſt prevalent.

Thirdly, by attending to the ſpontaneous phænomena which precede, accompany, or follow, the death or recovery of the patient, and the better or worſe ſtate of the diſorder.

Fourthly, by diligently remarking the benefit or injury received, from whatever the patients are unavoidably obliged to do; whatever is taken into, or diſcharged out of the body.

Fifthly, by comparing the caſes of a great many patients labouring under the diſtemper at the ſame time.

Sixthly, by abſtaining from all remedies which are dubious, which exagitate and induce a conſiderable change in the humours, and thereby obſcure the genus of the diſeaſe.

From theſe circumſtances, duly attended to, the curative indication ariſes.

EPIDERMIS, in anatomy, the ſame with the cuticle. See the article CUTICLE.

EPIDIDYMUS, in anatomy, the name by which ſome call the two bodies more uſually known by that of paraſtatæ. See the article PARASTATÆ.

EPIGASTRIC REGION, a part or ſubdiviſion of the abdomen. See ABDOMEN.

EPIGASTRIC VESSELS, the arteries and veins belonging to the epigaſtric region; the former being branches of the cœliac artery, and the latter of the iliac veins. See ARTERY and VEIN.

EPIGLOTTIS, in anatomy, one of the cartilages of the larynx, or wind-pipe. It is often of the ſhape of an ivy-leaf, and joined to the thyroide cartilage; over which it appears erect, immediately behind the root of the tongue; to which it is alſo connected by its middle ligament by two lateral ones to the cornua of the os hyoides, and by two poſterior ones to the arytenoide cartilage. In the act of ſwallowing it covers the glottis, or aperture of the larynx, and prevents any thing getting into it. See the articles LARYNX and GLOTTIS.

EPIGRAM, in poetry, a ſhort poem, or compoſition in verſe, treating of one thing only, and whoſe diſtinguiſhing characters are brevity, beauty, and point.

The word epigram ſignifies inſcription; for epigrams derive their origin from thoſe inſcriptions placed by the ancients on their ſtatues, temples, pillars, triumphal arches, and the like; which, at firſt, were very ſhort, being ſometimes no more than a ſingle word, but afterwards, increaſing their length, they made them in verſe, to be the better retained by the memory. This ſhort way of writing came at laſt to be uſed upon any occaſion or ſubject; and hence the name of epigram has been given to any little copy of verſes, without regard to the original application of ſuch poems.

Its uſual limits are from two to twenty verſes, though ſometimes it extends to fifty; but the ſhorter the better it is, and the more perfect, as it partakes more of the nature and character of this kind of poem: beſides, the epigram, being only a ſingle thought, ought to be expreſſed in a little compaſs, or elſe it loſes its force and ſtrength.

The beauty required in an epigram, is an harmony and apt agreement of all its parts, a ſweet ſimplicity, and polite language.

The point is a ſharp, lively, unexpected turn of wit, with which an epigram ought to be concluded. There are ſome critics, indeed, who will not admit the point in an epigram, but require the thought to be equally diffuſed through the whole poem, which is uſually the practice of Catullus, as the former is that of Martial. It is allowed, there is more delicacy in the manner of Catullus, but the point is more agreeable to the general taſte, and ſeems to be the chief characteriſtic of the epigram.

This ſort of poem admits of all manner of ſubjects, provided that brevity, beauty, and point, are preſerved; but it is generally employed either in praiſe or ſatire.

Though the beſt epigrams are ſaid to be ſuch as are compriſed in two or four verſes, we are not to underſtand it as if none can be perfect which exceed thoſe limits. Neither the antients or moderns have been ſo ſcrupulous with reſpect to the length of their epigrams; but, however, brevity in general is always to be ſtudied in theſe compoſitions.

EPILEPSY, επιλημψια, in medicine, the ſame with what is called the falling-ſickneſs, from the patient's falling ſuddenly to the ground.

Sometimes this diſeaſe comes upon the patient unawares; but it more frequently gives notice of its approach, by a laſſitude of the whole body, a heavy pain in the head, with ſome diſturbance of the ſenſes, unquiet ſleep, unuſual dread, dimneſs of ſight, and a noiſe in the ears: in ſome there is a vio-

violent palpitation of the heart, a puffing or inflation of the breaſt, difficult reſpiration, a murmuring noiſe in the belly, fœtid ſtools, a flux of the urine, and refrigeration of the joints: in others, there is a ſenſation as it were of cold air, aſcending from the extreme parts towards the brain and heart. At length, falling ſenſeleſs to the ground, the thumbs are ſhut up cloſe in the palms of the hands, and are with difficulty taken out; the eyes are diſtorted or inverted, ſo as nothing but the whites appear: all ſenſation is ſuſpended, inſomuch that no ſmell, no noiſe, nor even pinching of the body, is able to bring them to themſelves: they froth at the mouth with a hiſſing kind of noiſe; the tongue is lacerated, or torn by the teeth, and there is a ſhaking or trembling of the joints. However, in different patients the ſymptoms vary; for ſometimes, inſtead of convulſive motions, the limbs are all ſtiff, and the patient is as immoveable as a ſtatue: in infants the penis is erected; and in young men, there is an emiſſion of the ſemen, and the urine ſometimes ſtreams out to a great diſtance. At laſt there is a remiſſion of the ſymptoms, and the patients come to themſelves after a longer or ſhorter interval; then they complain of a pain and heavineſs of the head, and a laſſitude of all their joints.

Theſe fits uſually return on certain days, or age of the moon, but eſpecially about the new or full moon; in women, chiefly about the time of menſtruation; and as to the prognoſtics, they generally leave the patient about the time of puberty.

As to the cure, in adults, or grown perſons, it is extremely difficult; but in children, it is juſt the reverſe. Bliſters laid on the back part of the head are of great uſe a little before the fit is expected; which may the more certainly be foreknown, as this diſeaſe is influenced by the moon. The moſt proper medicines to correct the juices ſeem to be native cinnabar, and wild valerian root; a dram of which may be taken morning and evening for three or four months, and afterwards two or three days before the new and full moon. Or, two ſcruples of the powder of wild valerian root, mixed with one of that of native cinnabar, may be taken morning and evening. Ambergriſe and muſk are alſo accounted excellent.

It muſt not however be forgot, that this diſeaſe owes its origin to ſo many different conſtitutions of the body, that the ſame remedy which ſucceeds in one caſe, often fails in another; and, therefore, different medicines are to be tried, eſpecially in adults. In caſe of a plethora, bleeding in the ancles will be proper. If the humours be in fault, cathartics, iſſues, cauteries, and bliſters muſt be uſed. If in children it proceeds from gripes, or the breeding of teeth, nothing is better than to cleanſe the belly by milk clyſters, with a little venice-ſoap diſſolved in them. Some epileptic powder with cinnabar, or extract of rhubarb, and made into an electuary with ſyrup of roſes and manna, may likewiſe be given in proper doſes.

During the fit, too free an uſe of volatiles, ſpirituous liquors, and ſtrong ſmells, are hurtful, as cauſing the humours to flow too much to the head. The beſt method is to place the patient in an erect poſture, and to rub the hands and feet pretty briſkly; and the beſt drink is pure water, which will mitigate, if not cure, the ſymptoms.

When the diſeaſe is cauſed by external violence, or extravaſations of humours in the head, cinnabar reduced into an impalpable powder, and given in large doſes with other cephalics and diaphoretics, has a kind of ſpecific virtue.

According to Dr. Cheyne, a milk-diet will cure the moſt inveterate epilepſy. Miſletoe is alſo ſaid to cure it, as ſure as the bark does an intermitting fever: its doſe, to grown people, is half a dram or more, in powder, to be taken every ſixth hour, drinking after it a draught of a ſtrong infuſion of the ſame plant; and if to every ounce of the powder, a dram of aſa-fœtida be added, the medicine will be ſtill more effectual. Cinnabar of antimony is alſo greatly celebrated for the cure of this diſeaſe, and may be taken from four grains to a ſcruple, in conſerve of roſemary-flowers. If the diſeaſe is inveterate, ſome adviſe to give the following pills for a month, viz. Take caſtor and gum ammoniac, of each eight grains; wild valerian-root, half a ſcruple; ſalt of tartar, ſeven grains; and as much of the tincture of caſtor as is ſufficient to form them into pills, one of which makes a doſe. On every ſeventh day, a cathartic ſhould be given; and ſometimes, inſtead of the caſtor and gum, filings of ſteel may be ſubſtituted.

A decoction of guaiacum, or ſaſſafras, taken twice a day, ſix or eight ounces at a time, and continued for thirty or forty days, is alſo ſaid to cure the epilepſy; eſpecially if male piony-root, or the like, be added.

EPILOBIUM, French willow, in botany, a genus of plants whoſe flower conſiſts of four roundiſh patent petals ſomewhat emarginated, with eight filaments which are ſubulated and alternately ſhorter, theſe are topped with oval compreſſed obtuſe antheræ; the fruit is a very long, cylindraceous, ſtriated capſule, with four cells, and contains a number of oblong ſeeds crowned with down.

This genus includes the chamænerion of Tournefort.

EPILOGUE, in oratory, the end or concluſion of a diſcourſe, ordinarily containing a recapitulation of the principal matters delivered. See PERORATION.

EPILOGUE, in dramatic poetry, a ſpeech addreſſed to the audience after the play is over, by one of the principal actors therein, uſually containing

taining ſome reflections on certain incidents in the play, eſpecially thoſe in the part of the perſon that ſpeaks it.

EPIMEDIUM, barren-wort, in botany, a plant with a creeping root, from which ariſe many ſtalks about nine inches high, each of which is divided into three branches, which are again ſubdivided into three leſſer, upon each of theſe are a ſtiff cordated leaf ending in a point, of a pale green on the upper ſide but grey underneath; below the firſt diviſion of the ſtalk come out the flowers, which are cruciform of a rediſh colour with yellow ſtripes on the border, the ſtamina are four ſubulated filaments topped with oblong erect bivalvular antheræ. The fruit is an oblong acuminated pod of one cell, containing many oblong ſeeds.

EPINICION, in the Greek and Latin poetry, denotes a poem or compoſition on occaſion of a victory obtained. It alſo ſignifies a rejoicing, or feſtival, on account of a victory.

EPIPHANY, a Chriſtian feſtival, otherwiſe called the Manifeſtation of Chriſt to the Gentiles, obſerved on the ſixth of January, in honour of the appearance of our Saviour to the three magi, or wiſe men, who came to adore him and bring him preſents. The feaſt of Epiphany was not originally a diſtinct feſtival, but made a part of that of the nativity of Chriſt, which being celebrated twelve days, the firſt and laſt of which were high or chief days of ſolemnity, either of theſe might be called Epiphany, as that word ſignifies the appearance of Chriſt in the world.

EPIPHONEMA, in rhetoric, a ſententious exclamation, containing a lively remark placed at the end of a diſcourſe; ſuch is that of Virgil:

Fas omne abrumpit, Polydorum obtruncat, & auro
Vi potitur. Quid non mortalia pectora cogis
Auri ſacra fames?

And that of Lucretius, lib. i.

Tantum relligio potuit ſuadere malorum!

This figure cloſes a narration in a very advantageous manner, deeply impreſſes the thing related upon the memory of the reader, and leaves him well pleaſed with the ſenſe and ſagacity of his author.

EPIPHORA, in medicine, a preternatural defluxion of the eyes, when they continually diſcharge a ſharp ſerous humour, which excoriates the cheeks. The cure is performed by a derivation of the offending humour elſewhere, by bleeding, cupping, bliſters, purges, &c. The acrimony is likewiſe to be corrected by bitter chalybeate wine: ſometimes wine drank alone will perform the cure; after which, aſtringent topics are to be made uſe of. See the article RHEUM.

If an epiphora has been of long ſtanding, it is difficult to be cured, and often degenerates into a fiſtula lachrymalis. See the article FISTILA LACHRYMALIS.

EPIPHYLLOSPERMOUS, from φυλλον, a leaf, and σπερμα, ſeed, among botaniſts, are thoſe plants which bear their ſeeds on the back of their leaves, ſuch as maidenhair, fern, &c. and are the ſame as capillary plants.

EPIPHYSIS, in anatomy, a bony ſubſtance, or as it were a leſſer bone affixed to a larger or principal bone, by the intervention of a cartilage. In young people theſe epiphyſes are not continuous to the principal bone, but are only connected by the intermediate cartilage, and hence they are called appendages to the bones. It is to be obſerved of epiphyſes, 1. That they are all cartilaginous in infants; and though they afterwards grow hard, yet they never arrive at the true denſity of a bone. 2. That moſt of them degenerate into apophyſes in adults. 3. That they do not grow along the plain ſurface of the bone, but unequally, or by a mutual ingreſs with the body of it.

The uſe of the epiphyſes is very different in adults and in infants: 1. In adults they ſeem to ſerve the bones which contain large quantities of marrow, by way of operculum, that this ſoft matter may not run out. 2. They are of ſervice to the articulators, rendering the motions more eaſy, as well as more determinate. 3. They make the whole bone lighter than it would be, if their place were ſupplied by abſolute bony matter. 4. They increaſe the power of the muſcles about the tendons, by means of their prominences. 5. They add to the ſize of the places deſtined for receiving the inſertions of the muſcles. 6. They give a firmer coheſion to the ligaments which ſerve in the articulations, and allow an entrance to the blood-veſſels. The uſes of the epiphyſes in infants are, 1. That by means of their yielding ſoftneſs, they may give way to the compreſſion in the uterus, and ſuffer the whole bulk to be more folded together than otherwiſe it could, ſo that it may lie in a ſmaller compaſs. 2. That they may give way to the elongation and growth of the bones. 3. That they may prevent the frequent fractures, which would otherwiſe unqueſtionably happen to children from their falls, and the other accidents they are liable to.

EPIPLOCELE, in medicine, is a kind of hernia, or rupture, in which the omentum ſubſides into the ſcrotum. The cure conſiſts principally in a reduction of the tumour, by returning the omentum again into the abdomen, and in ſecuring the parts from a relapſe by a truſs or bandage. See HERNIA and ENTEROCELE.

EPIPLOIS, in anatomy, a term applied to the arteries and veins diſtributed through the ſubſtance of the epiploon or caul: thus, the dextera epiplois is a branch of the right ſide of the cæliac artery, and the ſiniſtra epiplois and gaſtro-epiplois are terms by which anatomiſts call branches from the left ſide of the

the cæliac artery. See the articles CÆLIAC and ARTERY.

EPIPLOOMPHALON, *επιπλοομφαλον*, in medicine, an hernia umbilicalis, proceeding from the omentum falling into the region of the umbilicus or naval. See the article EXOMPHALUS.

EPIPLOON, the ſame with what is otherwiſe called omentum. See OMENTUM.

EPIPLOSARCOMPHALUS, in ſurgery, a kind of exomphalus. See the article EXOMPHALUS.

EPISCOPACY, the quality of epiſcopal government, or that form of church diſcipline, wherein dioceſan biſhops are eſtabliſhed diſtinct form, and ſuperior to, prieſts or preſbyters. See BISHOP.

EPISCOPAL, ſomething belonging to biſhops. See the articles BISHOP and EPISCOPACY.

EPISCOPALIANS, in church hiſtory, an appellation given to thoſe who prefer the epiſcopal government and diſcipline to all others.

EPISODE, *επεισοδιον*, in poetry, a ſeparate incident, ſtory, or action, which a poet invents, and connects with his principal action, that his work may abound with a greater diverſity of events: though, in a more limited ſenſe, all the particular incidents whereof the action or narration is compounded, are called epiſodes. See the articles EPIC and TRAGEDY.

The epiſode, in its original, was only ſomething rehearſed between the parts of the chorus, or ancient tragedy, for the diverſion of the audience. Epiſodes ſerve to promote the action, to illuſtrate, embelliſh, and adorn it, and carry it to its proper period. Epiſodes are either abſolutely neceſſary, or very requiſite. All epiſodes are incidents, though all incidents are not epiſodes; becauſe ſome incidents are not adventitious to the action, but make up the very form and ſeries of it. Examples will clear up this diſtinction: the ſtorm in the firſt Æneid of Virgil, driving the fleet on the coaſt of Carthage, is an incident, not an epiſode, becauſe the hero himſelf and the whole body of his forces are concerned in it; and ſo it is a direct and not a collateral part of the main action. The adventures of Niſus and Euryalus, in the ninth Æneid, are epiſodes, not incidents, i. e. not direct parts of the main action.

It is particularly by the art of epiſodes that the great variety of matter which adorns a poem is brought into the principal action: but though the epiſodes are a kind of digreſſion from the ſubject, yet they ought to have a natural relation to the principal action, never be far fetched, and muſt be handled with judgment, to avoid confuſion and burdening the ſubject with too much action. Without this reſtriction the epiſode is no longer probable, and there appears an air of affectation which becomes ridiculous. Ariſtotle calls all thoſe fables epiſodic, which abound in epiſodes not neceſſarily nor properly connected with each other.

The moſt natural epiſodes are the propereſt to circumſtantiate the principal actions, namely, the cauſes, the effects, the beginnings, and the conſequences of it. Homer and Virgil have ſhewn their principal art in this particular: the action of the Iliad and that of the Æneid were in themſelves exceeding ſhort, but are ſo beautifully lengthened and diverſified by the intervention of epiſodes, that they make up an agreeable ſtory, ſufficient to employ the memory without overcharging it. See the article EPIC.

Our noble poet Milton has excelled in this art; he has no other epiſodes than what naturally ariſe from the ſubject, and yet his poem of Paradiſe Loſt is filled with a multitude of aſtoniſhing incidents. Thoſe great actions, the battle of the angels, and the creation of the world, are by way of epiſode to this noble poem. With the like art, and in the ſame manner, in that part of it which regards the fall of man, he has related the fall of thoſe angels who are his profeſſed enemies; beſides the many other beauties of ſuch an epiſode, its running parallel with the great action of the poem, hinders it from breaking unity ſo much as another epiſode would have done, that had not ſo great an affinity with the principal ſubject.

EPISPASTIC, in medicine, a topical remedy, which being applied to the external parts of the body, attracts the humours to that part.

EPISTLE, *επιστολη*, denotes the ſame with a miſſive letter; but is now chiefly uſed in ſpeaking of ancient writings, as the epiſtles of St. Paul, epiſtles of Cicero, epiſtles of Pliny, &c. See the article LETTER.

EPISTOLARY, ſomething belonging to an epiſtle.

EPISTROPHE, in rhetoric, a figure wherein that which is ſuppoſed of one thing is ſtrongly affirmed of another: thus, "Are they Hebrews? ſo "am I. Are they Iſraelites? ſo am I. Are they "of the ſeed of Abraham? ſo am I," &c.

EPISTYLE, in the ancient architecture, a term uſed by the Greeks for what we call architrave, viz. a maſſive piece of ſtone or wood, laid immediately over the capital of a column. See ARCHITRAVE and COLUMN.

EPITAPH, a monumental inſcription, which generally contains ſome elogium of the virtues and good qualities of the deceaſed, and has a turn of ſerioufneſs and gravity adapted to the nature of the ſubject. The elegance of epitaphs conſiſts in a nervous and expreſſive brevity; and ſometimes are cloſed with an epigrammatic point. In theſe compoſitions no mere epithet, properly ſo called, ſhould be admitted; for here illuſtration would impair the ſtrength, and render the ſentiment too diffuſe and languid. Words that are ſynonimous are alſo to be rejected.

Though

Though the true charactereſtic of the epitaph is ſerioufneſs and gravity, yet we find many that are jocoſe and ludicrous; ſome likewiſe have true metre and rhyme, while others are between proſe and verſe, without any certain meaſure, though the words are truly poetical, and the beauty of this laſt ſort is generally heightened by an apt and judicious antitheſis.

EPITASIS, in ancient poetry, the ſecond part or diviſion of a dramatic poem, wherein the plot, entered upon in the firſt part, or protaſis, was carried on, heightened and worked up till it arrived at its ſtate or height, called cataſtaſis.

In the epitaſis, accidents, as they are called by the moderns, ariſe; all things are in confuſion, and involved in doubts and difficulties. Voſſius ſays, the epitaſis is contained in the ſecond, ſometimes in the third and fourth, but very rarely any part of it in the fifth act: but Dr. Trapp ſays, that there is no act to which the epitaſis is not ſuitable; nay, that ſome of it ought always to be in the fifth act.

It is the epitaſis that ſupports the weight and burden of the poem; upon it the criſis of the action chiefly turns. This diviſion of tragedy is laid aſide in the modern drama, inſtead of which plays are divided into acts.

EPITASIS, in medicine, the increaſe of a diſeaſe, or beginning of a paroxyſm, particularly in a fever. See FEVER.

EPITHALAMIUM, in poetry, a nuptial ſong, or compoſition, in praiſe of the bride and bridegroom, praying for their proſperity, for a happy offſpring, &c.

EPITHEM, in pharmacy, a kind of fomentation, or remedy of a ſpirtuous aromatic kind, applied externally to the regions of the heart, liver, &c. to ſtrengthen and comfort the ſame, or to correct ſome intemperature thereof.

EPITHET, in poetry and rhetoric, an adjective expreſſing ſome quality of a ſubſtantive to which it is joined; or ſuch an adjective as is annexed to ſubſtantives by way of ornament and illuſtration, not to make up an eſſential part of the deſcription. Nothing, ſays Ariſtotle, tires the reader more than too great a redundancy of epithets, or epithets placed improperly; and yet nothing is ſo eſſential in poetry as a proper uſe of them. The writings of the beſt poets are full of them, eſpecially Virgil.

EPITOME, in literary hiſtory, an abridgement, or ſummary of any book, particularly of a hiſtory. See ABRIDGEMENT.

EPITRITUS, in proſody, a foot conſiſting of three long ſyllables and one ſhort. Of theſe, grammarians reckon four kinds; the firſt conſiſting of an iambus and ſpondee, as *sălūtāntēs:* the ſecond, of a trocheus and ſpondee, as *cōncŭtātī:* the third, of a ſpondee and an iambus, as *cōmmūnĭcāns:* and the fourth, of a ſpondee and trocheus, as *incāntārĕ.* See the articles SPONDÆUS, TROCHEUS, &c.

EPITROPE, in rhetoric, a Greek term for the ſame figure which the Latins call *conceſſio.* See the article CONCESSION.

EPIZEUXIS, in rhetoric, a figure which repeats the ſame word, without any other intervening: ſuch is that of Virgil, *nunc, nunc, inſurgite remis.*

EPOCHA, or EPOCHE, in chronology, ſignifies ſome remarkable occurrence from whence ſome nations date and meaſure their computation of time.

As in the heavens there are certain points from which the aſtronomers begin their computations of the planets motions, ſo alſo there muſt be certain points, or inſtants of time, from which, as from roots, all calculations muſt begin: and all memorable actions are diſpoſed and recorded according to the ſeries of years which follow from that root. Theſe roots are called Epochs, or Æras, from which we generally count our years and times. The moſt famous, beſt known, and moſt uſed by us, is that which is reckoned from the nativity of our Lord Jeſus, which begins at the kalends of January that immediately followed his birth.

The epocha of the creation, which is much noted, yet about it there are great controverſies among chronologiſts; ſome affirming that the world was created 3950 years before the birth of Chriſt; others again ſay, that at the birth of Chriſt the age of the world was 3983 years. The Greek church, and the emperors of the Eaſt, uſed an epocha of the creation which was much more ancient, and makes the world to have been created 5509 years before the coming of Chriſt.

Among the prophane authors, the moſt ancient epocha is that of the Olympiads, which begun at the ſummer of the year 777 preceding the birth of Chriſt, and on the kalends of July.

The epoch of Rome, or of the building of the city, is not long after the Olympiads, and there are two of them, the Varronian, and Capitolian; according to the firſt, the city was built the year before Chriſt 753; according to the other, it was in the year 752.

The æra of Nabonaſſar has always been famous among the aſtronomers, and began on the ſixth of February of the Julian year carried backward, and before Chriſt 747. And becauſe that day was then the firſt of the Egyptian year, Ptolomy, and after him Copernicus, computed the motion of the ſtars according to that æra by Egyptian years; for the Egyptian year is very convenient for aſtronomical calculations, it being interrupted by no intercalary days.

After this we have another epocha of the death of Alexander the Great, the 324th year before Chriſt, on the twelfth of November; which was then the firſt day of the Egyptian year. Theon, Albategnius, and ſome others, have computed from thence according to the Egyptian year. Between the two æras of Nabonaſſar and of the death of Alexander, there

Fig. 1. Self moving Engine.

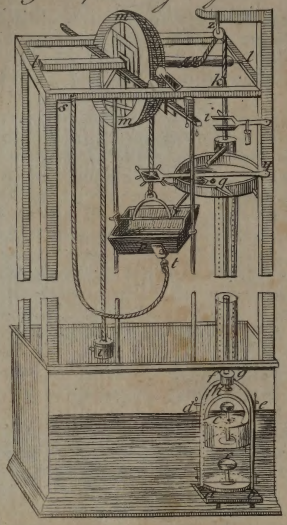


Fig. 2. Epicycloid.

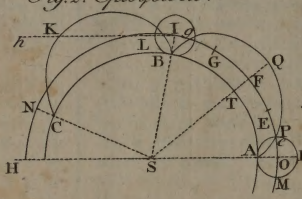


Fig. 3. Epicycloid.

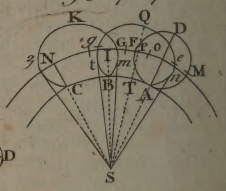


Fig. 4. Epicycloid.

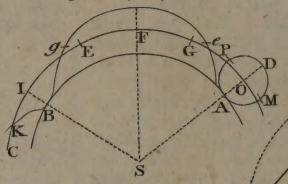


Fig. 5. Equation.

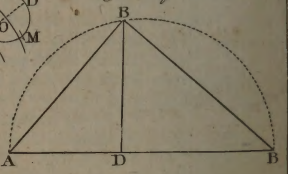


Fig. 9.

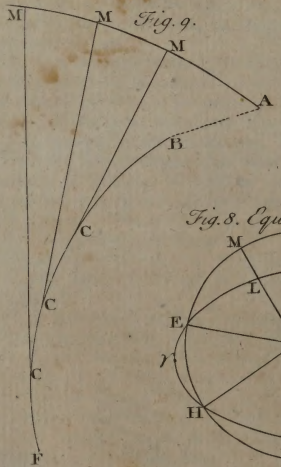


Fig. 6. Equation of Time.

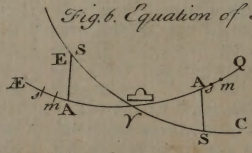


Fig. 7. Equation of Time.

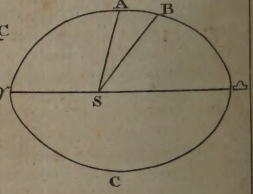


Fig. 8. Equation of Time.

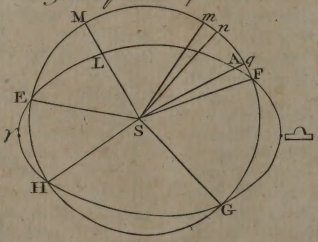
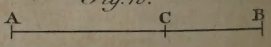


Fig. 10.



T. Ledge sculp.

there are precisely 424 Egyptian years. The Abissines reckon by another æra, which is called the Æra of the Martyrs, or of Diocletian. The Turks and Arabians reckon by an æra, which they call the Hegira, which takes its beginning from the flight of Mahomet. The Persians have likewise an epoch which they call Jesdegird; all which are explained by the chronologists. But the Julian period seems to be the most useful and convenient of all, it including almost all other æras within it, and it is a period of 7980 years; which number is composed by the multiplication of the three numbers, 15, 19, and 28. The first is the cycle of the indiction; the second is the Metonic cycle of the moon; and the third is the cycle of the sun. And the first year of this period was that wherein all these three cycles began together.

The following table gives the year of the several æras, and reduces them to the years of the Julian period, and to the years before or after the birth of Christ.

	Years before Christ.	Years of the Julian Period.
The creation of the world according to the Greek emperors	5508	
The common æra of the creation	3950	765
The beginning of the Olympiads	776	3938
The building of Rome according to Varro	753	3961
The building of Rome, according to the registers of the capitol	752	3962
The æra of Nabonassor	747	3967
The death of Alexander the Great	324	4390
	Years after Christ.	
The common Christian epoch	1	4714
The Diocletian æra	284	4997
The hegira of the Turks	622	5335
The jesdegird of the Persians	632	5345

EPODE, in lyric poetry, the third or last part of the ode, the ancient ode being divided into strophe, antistrophe, and epode. See ODE, &c.

The epode was sung by the priests, standing still before the altar, after all the turns and returns of the strophe and antistrophe, and was not confined to any precise number or kind of verses.

The epode is now a general name for all kinds of little verses that follow one or more great ones, of what kind soever they be; and in this sense a pentameter is an epode after an hexameter. And as every little verse, which being put after another, closes the period, is called epode; hence the sixth book of Horace's Odes is entitled, *Liber Epodon*, Book of Epodes, because the verses are all alternately long and short, and the short ones generally, though not always, close the sense of the long one.

EPOMIS, in anatomy, a muscle, otherwise called deltoides. See DELTOIDES.

EPOPOEIA, in poetry, the story, fable, or subject treated of in an epic poem. See FABLE.

The word is commonly used for the epic poem itself. See EPIC POEM.

EPULONES, in Roman antiquity, ministers who assisted at the sacrifices, and had the care of the sacred banquet committed to them.

EQUABLE, an appellation given to such motions as always continue the same in degree of velocity, without being either accelerated or retarded.

EQUAL, a term of relation between two or more things of the same magnitude, quantity, or quality.

EQUALITY, that agreement between two or more things, whereby they are denominated equal.

The equality of two quantities, in algebra, is denoted by two parallel lines placed between them: thus, $4+2=6$, that is, 4 added to 2, is equal to 6.

EQUANIMITY, in ethics, denotes that even and calm frame of mind and temper, under good or bad fortune, whereby a man appears to be neither puffed up, or overjoyed with prosperity; nor dispirited, soured, or rendered uneasy by adversity.

EQUANT, ÆQUANT, or *Circle of* EQUALITY, in astronomy, is a circle used in the Ptolemaic system to account for the eccentricity of the planets, &c.

EQUATION, in algebra, is a proposition wherein one quantity is declared equal to another, or where one expression of any quantity is declared equal to another expression of the same quantity: as when we say $\frac{2}{4}=\frac{3}{6}$; where $\frac{2}{4}$ is said to possess one side of the equation, and $\frac{3}{6}$ the other.

An affected quadratic equation is an equation consisting of three different sorts of quantities; one wherein the square of the unknown quantity is concerned, another wherein the unknown quantity is simply concerned, and a third wherein it is not concerned at all: as if $xx-2x=3$; supposing x to be an unknown quantity.

If either the term wherein the simple power of x is concerned, as $-2x$, or that which is called the absolute term, to wit, 3, be wanting, the equation is still a quadratic equation, though incomplear. Some indeed there are, who rank this latter sort of equations under the denomination of simple equations; and so shall we, upon account of their easy resolution; though properly speaking, a simple equation is that wherein some simple power of the unknown quantity is concerned, all others being excluded: as if $3x=6$; $2x+3=4x-5$, &c.

The use of these equations is for representing more conveniently and more distinctly the conditions of problems, when translated out of common language into that of algebra. As for example; let it be proposed to find a number with the following pro-

property, to wit, that $\frac{2}{3}$ of it with 4 over, may amount to the same as $\frac{7}{12}$ of it with 9 over: here, putting x for the unknown quantity, the condition of this problem, when translated out of common language into that of algebra, will be represented by the following equation, to wit, $\frac{2x}{3} + 4 = \frac{7x}{12} + 9$: for $\frac{2}{3}$ of x, that is, $\frac{2}{3}$ of $\frac{x}{1}$ is $\frac{2x}{3}$; therefore $\frac{2x}{3} + 4$ signifies $\frac{2}{3}$ of x with 4 over; and since this expression according to the problem, amounts to the same with the other, to wit, $\frac{7x}{12} + 9$; hence it is that we pronounce them equal to one another.

Now since in the foregoing equation, as well as in almost all others arising immediately from the conditions of problems themselves, the unknown quantity is embarrassed and entangled with such as are known, the way to disengage it from such known quantities, so that itself alone possessing one side of the equation, may be found equal to such as are entirely known on the other, that is, in the present case, to determine the value of the unknown quantity x, is what is commonly called the resolution of an equation: for the effecting of which, several axioms and processes are required; some whereof, namely such as most frequently occur, I shall here put down; the rest I shall take notice of occasionally, as they offer themselves.

Of the resolution of simple EQUATIONS.

Axiom I. Whenever a fraction is to be multiplied by a whole number, it will be sufficient to multiply only the numerator by that number, retaining the denominator the same as before. Thus $\frac{4}{5}$ multiplied into 2, gives $\frac{8}{5}$, for the same reason that 4 shillings multiplied into 2 gives 8 shillings: thus in the first example following, $\frac{7x}{12}$ multiplied into 3, gives $\frac{21x}{12}$.

Axiom II. But if the whole number into which the fraction is to be multiplied, be equal to the denominator of the fraction, then throw away the denominator, and the numerator alone will be the product. Thus the fraction $\frac{a}{b}$ multiplied into b, gives $\frac{ab}{b}$ or a: thus in the first example, $\frac{2x}{3}$ multiplied into 3, gives $2x$; and $\frac{21x}{12}$ multiplied into 12 gives $21x$.

Axiom III. If the two sides of an equation be multiplied or divided by the same number, the two products, or quotients, will still be equal to each other. Thus in the first example, where $\frac{2x}{3} + 4 = \frac{7x}{12} + 9$; if both sides of the equation be multiplied into 3, we shall have $2x + 12 = \frac{21x}{12} + 27$; and if again this last equation be multiplied into 12, we shall have $24x + 144 = 21x + 324$.

Axiom IV. If a quantity be taken from either side of an equation, and placed on the other with a contrary sign, which is commonly called transposition, the two sides will still be equal to each other. Thus if $7 + 3 = 10$, transpose $+3$, and you will have $7 = 10 - 3$; thus if $7 - 3 = 4$, transpose -3, and you will have $7 = 4 + 3$; thus if (as in the first example) $24x + 144 = 21x + 324$, transpose $21x$, and you will have $24x - 21x + 144 = 324$, that is, $3x + 144 = 324$; and if again in this last equation you transpose 144, you will have $3x = 324 - 144 = 180$.

Transposition therefore, as it is here delivered, is nothing but a general name for adding or subtracting equal quantities from the two sides of an equation; in which case it is no wonder, if the sums or differences still continue equal to each other. As for instance, in this equation $a - b = c$, transposing $-b$ we have $a = c + b$: and what is this after all, but adding b to both sides of the equation? for if b be added to $a - b$, the sum will be a; and if b be added to c, the sum will be $c + b$; therefore $a = c + b$: again, in the equation $a + b = c$, transposing $+b$ we have $a = c - b$, which is nothing else but subtracting b from both sides of the equation.

The 1st process. If, when an equation is to be resolved, fractions be found on one, or both sides, it must be freed from them by multiplying the whole equation into the denominators of those fractions successively.

The 2d process. After the equation is thus reduced to integral terms, if the unknown quantity be found on both sides the equation, let it be brought by transposition to one and the same side, viz. to that side, which after reduction will exhibit it affirmative.

The third process. After this, if any loose known quantities be found on the same side with the unknown, let them also be brought by transposition to the other side of the equation.

The 4th process. If now the unknown quantity has any coefficient before it, divide all by that coefficient, and the equation will be resolved.

The 5th process. If the whole equation can be divided by the unknown quantity, let such a division be made, and the equation will be reduced to a more simple one. Thus in the 16th example you have $615x - 7xxx = 48x$; divide the whole equation by x, and you will have $615 - 7xx = 48$. In the 13th example you have $\frac{42x}{x-2} = \frac{35x}{x-3}$; divide the whole by x, which is done by dividing only the numerators of

of the two fractions, and you will have $\frac{42}{x+2} = \frac{35}{x-3}$.

The 6th process. If at last the square of the unknown quantity, and not the unknown quantity itself, appears to be equal to some known quantity on the other side of the equation, then the unknown quantity must be made equal to the square root of that which is known. Thus in the 14th example we have $xx = 36$; therefore $x = 6$, and not 18: in the 15th, we have $xx = 64$; therefore $x = 8$, the square root of 64, and not 32, its half.

Examples of the resolutions of simple EQUATIONS.

This preparation being made, I shall now give some examples of the resolution of simple equations; and my first example shall be the equation given in the last article, in order to trace out the number there described.

Example 1.

$$\frac{2x}{3} + 4 = \frac{7x}{12} + 9.$$

In this equation it is plain, that there are two fractions, $\frac{2x}{3}$, and $\frac{7x}{12}$, which must be taken off at two several operations, thus: as 3 is the denominator of the first fraction, multiply the whole equation by 3, and you will have $2x + 12 = \frac{21x}{12} + 27$: again, as the denominator of the remaining fraction is 12, multiply all by 12, and you will have $24x + 144 = 21x + 324$; which is an equation free from fractions.

2dly. It must in the next place be considered, that in this last equation $24x + 144 = 21x + 324$, the unknown quantity is concerned on both sides, to wit, $24x$ on one side, and $21x$ on the other; transpose therefore $21x$, and you will have $24x - 21x + 144 = 324$, that is, $3x + 144 = 324$. If it be asked why I chuse to transpose $21x$ rather than $24x$; my answer is, that had $24x$ been transposed, the unknown quantity, or its coefficient at least, after reduction, would have been negative, contrary to the rule in the second process; for resuming the equation $24x + 144 = 21x + 324$, if $24x$ be transposed, we shall have $144 = 21x - 24x + 324$, that is, $144 = -3x + 324$: but even in this case, another transposition will set all right; for if $-3x$ be transposed in this last equation, we shall then have $3x + 144 = 324$ as before: all that can be said then against this last way is, that it creates unnecessary transpositions, which an artist would always endeavour to avoid.

3dly. Having now reduced the equation to a much greater degree of simplicity than before, to wit, $3x + 144 = 324$; because the unknown quantity $3x$ has still a loose quantity, viz. 144 joined with it, transpose that quantity 144 to the other side of the equation, and you will have $3x = 324 - 144$, that is, $3x = 180$.

N. B. By a loose quantity I mean such a one as is joined with the unknown by the sign + or —, and not by way of multiplication, as is the coefficient 3 in the last equation.

4thly. By this time the quantity x is very near being discovered; for if $3x = 180$, it is but dividing all by 3, and we shall have $x = 60$: 60 therefore is the number described in the last article by this property, to wit, that $\frac{2}{3}$ of it with 4 over, will amount to the same as $\frac{7}{12}$ of it with 9 over: and that 60 has this property, will now be easily made to appear synthetically; for $\frac{2}{3}$ of 60 is 40, and this with 4 over is 44; moreover $\frac{7}{12}$ of 60 is 35, and this with 9 over is also 44.

N. B. A demonstration that proves the connection between any number and the property ascribed to it, is either analytical or synthetical; if this connection is shewn by tracing the number from the property, the demonstration of it is called an analytical demonstration; but if is is shewn by tracing the property from the number, the demonstration is then said to be synthetical.

Example 2.

$$\frac{2x}{3} + 12 = \frac{4x}{5} + 6$$

Here multiply by 3, and you will have $2x + 36 = \frac{12x}{5} + 18$; multiply again by 5, and you will have $10x + 180 = 12x + 90$; transpose $10x$, and you will have $180 = 12x - 10x + 90$, that is, $180 = 2x + 90$, or rather $2x + 90 = 180$, for I generally choose to have the unknown quantity on the first side of the equation; transpose 90, and you will have $2x = 180 - 90$, that is, $2x = 90$; divide by 2, and you will have $x = 45$.

Proof. The original equation was $\frac{2x}{3} + 12 = \frac{4x}{5} + 6$: now if $x = 45$, we have $\frac{2x}{3} = 30$, and $\frac{2x}{3} + 12 = 42$: again we have $\frac{4x}{5} = 36$, and $\frac{4x}{5} + 6 = 42$: therefore $\frac{2x}{3} + 12 = \frac{4x}{5} + 6$, because the amount of both is 42.

Of EQUATIONS *in general, and their Roots.*

Definitions —Equations are usually denominated from the highest power of the unknown quantity that is alone concerned in them. Thus, if the unknown quantity arises to the third power, the equation is called a cubic equation; if to the fourth, a biquadratic; if to the fifth, a quadrato-cubic; if to the

the ſixth, a bicubic, &c. but if an equation can (by a bare reduction of the powers of the unknown quantity) be brought down to a lower form, it then receives its denomination from that form. Thus the equation $x^6-ax^3+b=0$, where x is the unknown quantity, is called a quadratic, becauſe, by ſubſtituting y for x^3, it may be reduced to one: thus again, the equation $x^6-ax^4+bxx-c=0$ is called a cubic equation, becauſe it may be reduced to one by ſubſtituting y for xx.

The root of an equation is ſuch a quantity, as being ſubſtituted for the unknown quantity, will make the two ſides equal one to the other; or, which is the ſame thing, if all the parts of an equation be thrown to one ſide, and ſo be made equal to nothing on the other, then that is ſaid to be the root of the equation, which being ſubſtituted for the unknown quantity, will make the whole equation to vaniſh. Thus the roots of the equation $xx-8x+15=0$ are 3 and 5, becauſe either of theſe numbers being put for x will make the whole equation to vaniſh; and there are no others beſides in the whole ſcale of numbers that will have that effect.

Every equation hath as many roots, poſſible and impoſſible, as there are dimentions in the higheſt power of the unknown quantity. Thus every cubic equation has three roots, every biquadratic four, &c. But it often happens that ſome of theſe roots are impoſſible, and ſometimes that they are all ſo, if the index of the higheſt power of the unknown quantity be an even number; for if it be otherwiſe, the equation will always have one root at leaſt poſſible, as will be evident from what will be ſaid hereafter when we come to treat of the conſtitution of equations. Thus the equation $x^3=1$ hath indeed three roots, but it hath but one real root, to wit, unity, the other two being impoſſible, to wit, $\frac{-1+\sqrt{-3}}{2}$ and $\frac{-1-\sqrt{-3}}{2}$. Let us ſee, however, how theſe impoſſible numbers, being ſubſtituted for x, will make $x^3=1$: and firſt let us make $x=\frac{-1+\sqrt{-3}}{2}$. Make $-1=a$, and $\sqrt{-3}=b$; then you will have $x^3=\frac{a^3+3a^2b+3ab^2+b^3}{8}$, whereof $a^3=-1$; $3aab=+3\times\sqrt{-3}=3\sqrt{-3}$: again, as $b=\sqrt{-3}$, we ſhall have $b^2=-3$, and $3ab^2=-3\times-3=+9$: laſtly, b^3, or $b^2\times b=-3\sqrt{-3}$; therefore $x^3=\frac{-1+3\sqrt{-3}+9-3\sqrt{-3}}{8}=\frac{-1+9}{8}=1$. Let us now put $\frac{-1-\sqrt{-3}}{2}$ for x; and making $-1=a$, and $-\sqrt{-3}=b$, we ſhall have the firſt term of x^1, wherein b is not concerned, and the third term, wherein b^2 is only concerned, the ſame as before; but the ſecond and fourth terms, wherein b and b^3 are concerned, will have their ſigns changed: therefore in this caſe $x^3=\frac{-1-3\sqrt{-3}+9+3\sqrt{-3}}{8}=1$.

Of the generation of EQUATIONS.

To form an equation that has any number of given roots.—This is eaſily done, firſt by changing the ſigns of all the roots given, and then joining them ſeverally to ſome indeterminate quantity; for if the quantities thus conſtituted be multiplied all together, and the product be made equal to nothing, you will have the equation deſired. As for inſtance, let it be required to form an equation that ſhall have theſe three roots and no more, to wit, 1, 2, and 3: now, if the ſigns of theſe roots be changed, and they be ſeverally joined with the indeterminate quantity x, they will conſtitute the quantities $x-1$, $x-2$, $x-3$; multiply all theſe together, and making their product equal to nothing, you will have the equation deſired, to wit, $x^3-6xx+11x-6=0$, whoſe roots are the numbers firſt propoſed, to wit, 1, 2, and 3.

This may eaſily be tried by ſubſtituting theſe numbers (one after another) for x in the equation: but the reaſon of this method will beſt be perceived by reſolving again the equations into its firſt factors, thus, $x-1\times x-2\times x-3=0$; I ſay then, that the roots of this equation are theſe three and no more, to wit, 1, 2, and 3. For firſt, if 1 be ſubſtituted for x in the equation $x-1\times x-2\times x-3=0$, you will have $1-1\times 1-2\times 1-3=0$; which muſt neceſſarily be ſo, becauſe one of the factors, to wit, $1-1$, equals 0. Make now x equal to 2 in the foregoing equation, and you will have $2-1\times 2-2\times 2-3=0$, becauſe $2-2$ is ſo. Laſtly, make x equal to 3, and you will have $3-1\times 3-2\times 3-3=0$, becauſe $3-3$ is ſo: therefore the three roots of this equation are the numbers 1, 2, and 3, from the very definition of a root.

Let us now ſee whether this equation can have any other roots beſides thoſe already mentioned; and, if poſſible, let r be a fourth root different from any of theſe: then if r be ſubſtituted for x in the equation, we ſhould have $r-1\times r-2\times r-3=0$; but now, as r is different from any of the numbers 1, 2, and 3, by the ſuppoſition, it follows that every one of the factors, $r-1$, $r-2$, $r-3$, muſt be ſomething; and if ſo, it will be impoſſible for theſe, when multiplied together, to produce nothing; therefore the foregoing equation admits of no other roots but thoſe already mentioned.

If I would add a fourth root to the foregoing equation, to wit, -5, I might either put it thus, $x-1\times x-2\times x-3\times x+5=0$, or I might multiply the cubic equation before found, to wit, $x^3-6xx+11x-6$ by $x+5$, and ſo make the product $x^4-x^3-19xx+49x-30=0$.

Whenever an equation may be wholly divided by the ſimple power, or by the ſquare, or the cube of the unknown quantity without a remainder, it is an infallible argument that one or two or three of the

roots

roots of such an equation are equal to nothing. Thus the equation $x^4-6x^3+11xx-6x=0$ may be divided by x without a remainder; whence I conclude that one of its roots is equal to nothing, as will be evident, either by substituting nothing for x in the equation, or by considering the equation as resolved into its constituent factors thus, $x\times x-1\times x-2\times x-3=0$; as if I had said $x-0\times x-1\times x-2\times x-3=0$; whence it is evident that 0 has as good a title to be a root of this equation as any of the rest.

From what has been laid down in the last article, it appears, that if any number of equations whose parts on one side are all equal to nothing on the other, be multiplied together, they will produce an equation of a superior form, whose roots will be the same with theirs. Thus, if the following equations be multiplied together, viz. $x-1=0$, whose root is 1, $x-2=0$, whose root is 2, and $x-3=0$, whose root is 3, they will produce the equation $x-1\times x-2\times x-3=0$, whose roots are 1, 2, and 3, by the last article. Again, let these equations be multiplied together, viz. $2x-3=0$, whose root is $\frac{3}{2}$, $4x-5=0$, whose root is $\frac{5}{4}$, and $6x-7=0$, whose root is $\frac{7}{6}$, and they will produce the equation $2x-3\times 4x-5\times 6x-7=0$, whose roots are $\frac{3}{2}$, $\frac{5}{4}$, and $\frac{7}{6}$: for if $2x-3\times 4x-5\times 6x-7=0$, we shall have by division $x-\frac{3}{2}\times x-\frac{5}{4}\times x-\frac{7}{6}=0$, and the roots of this equation are $\frac{3}{2}$, $\frac{5}{4}$, and $\frac{7}{6}$, by the last article. Lastly, let these two equations be multiplied together, to wit, $xx-ax+b=0$, whose roots we will call p and q, and $xx-cx+d=0$, whose roots we will suppose to be r and s; I say then that the roots of the equation $xx-ax+b\times xx-cx+d=0$, will be p, q, r, s. For first, as p is one of the roots of the equation $xx-ax+b=0$, it follows, from the nature of a root, that if x be put equal to p, the quantity $xx-ax+b$ must vanish; but if $xx-ax+b=0$, then $xx-ax+b\times xx-cx+d$ must be equal to nothing; therefore p is one of the roots of the equation $xx-ax+b\times xx-cx+d=0$: and the same may be observed in all the other roots q, r, s.

Hence it is that impossible roots creep into equations of all orders and degrees whatever: for if the roots of one or more quadratic equations that enter into the composition of an equation of a superior form, be impossible, the equation so formed must necessarily have the same impossible roots. And this is the reason why, in every equation, the number of impossible roots is always even; because the roots of a quadratic equation must always be both possible, or both impossible: but if the index of the highest term of an equation be an odd number, it must have at least one root possible, because such an equation cannot be formed wholly of quadratics; it must have a simple equation in its composition, over and above; and the root of a simple equation is always possible.

Of the coefficients of the terms of EQUATIONS.

If the roots of an equation have all their signs changed, and the equation itself be so ordered as that all its terms on one side may be equal to nothing on the other, having unity for the coefficient of its first term; I say then, that the coefficient of the second term will be the sum of all the roots thus changed, the coefficient of the third term will be the sum of all the different products that can be made out of them by multiplying them two and two together, the coefficient of the fourth term will be the sum of all the different products that can be obtained from them by multiplying them three and three together, the coefficient of the fifth term will be the sum of all the different products that can arise by multiplying them four and four together, &c. and thus may an equation be formed that shall have any number of given roots without continual multiplication. As for instance, suppose I would form an equation that shall have these four roots, 1, 2, 3, and -5: now these roots, when their signs are changed, will be -1, -2, -3, $+5$, whose sum is -1; therefore -1 will be the coefficient of the second term. Again, all the different products that can be made out of them by multiplying them two and two together, are -1×-2, -1×-3, $-1\times+5$, -2×-3, $-2\times+5$, $-3\times+5$, $=+2$, $+3$, -5, $+6$, -10, -15, $=-19$; therefore the coefficient of the third term will be -19. All the different products that can arise by multiplying them three and three together, are $-1\times-2\times-3$, $-1\times-2\times+5$, $-1\times-3\times+5$, $-2\times-3\times+5$, $=-6$, $+10$, $+15$, $+30$, $=49$; therefore 49 will be the coefficient of the fourth term. Lastly, there will be but one product obtainable by multiplying them all four together, that is $-1\times-2\times-3\times+5=-30$; therefore -30 will be the last term of the equation, and the whole equation will now be formed, to wit, $x^4-x^3-19xx+49x-30=0$.

Of the number of affirmative and negative roots in an EQUATION.

When the roots of an equation are all possible, and all its parts are thrown to one side so as to be made equal to nothing on the other, the number of affirmative and negative roots may be thus determined: as often as the signs change in passing from the highest term to the lowest, just so many roots of the equation will be affirmative; and as often as like signs follow one another, so many will be negative. As for instance, in the equation $x^4-x^3-19xx+49x-30=0$, where the order of the signs is $+$, $-$, $-$, $+$, $-$; $+$ in the first term being followed by $-$ in the second, argues one affirmative root; $-$ in the second term followed by $-$ in the third,

argues one root to be negative; — in the third term followed by + in the fourth, discovers another affirmative root; and + in the fourth term followed by — in the fifth, a third: so that if all the roots of this equation be possible, there will be three affirmative roots, and one negative, which is true; for the roots of this equation are +1, +2, +3, and —5, as was shewn in the last article.

This rule is usually ascribed to our countryman Harriott, who was undoubtedly the first discoverer of most of those general properties of equations hitherto delivered, or to be delivered. But whosoever it was that first hit upon it, this is certain, that he left no demonstration of it; nor have I ever met with one in any treatise of algebra that has hitherto fallen into my hands, though most of them make mention of the rule. And, indeed, whoever considers the immense number of cases that must necessarily come under consideration in a demonstration of this nature, will not be very ready to attempt it universally; I say universally, for equations of lower degrees are less embarrassed, as I have shewn already in the case of quadratic equations, and shall farther shew when I come more distinctly to consider cubics. On the other hand, it seems much more probable, that this rule was found out by experience than from any regular investigation of it; for let all the roots of an equation be affirmative, as $+a$, $+b$, $+c$; then the equation will be $\overline{x-a}\times\overline{x-b}\times\overline{x-c}=0$, that is,

$$\begin{array}{rrrr} & -a & +ab & \\ x^3 & -b\,x\,x & +ac\,x & -abc=0, \\ & -c & +bc & \end{array}$$

where there are as many changes of signs as there are roots. Let us now suppose all the roots of an equation to be negative, as $-a$, $-b$, $-c$; then the equation will be $\overline{x+a}\times\overline{x+b}\times\overline{x+c}=0$, that is,

$$\begin{array}{rrrr} & +a & +ab & \\ x^3 & +b\,x\,x & +ac\,x & +abc=0, \\ & +c & +bc & \end{array}$$

where there are no changes of signs at all: and from the formation of equations in the last article it is very visible, that these two extreme cases will be the same, how high soever the equation rises; that is, when all the roots are affirmative, there will be as many changes of signs as there are roots; and when none are affirmative, there will be no change at all. Now the question is, whether an ingenious artist would not take the hint, which could not well escape his observation, and immediately set himself to try, whether in all other cases the number of affirmative roots be not equal to the number of variations in the signs as they follow one another.

But here the reader ought to be put in mind, that it very often happens, especially in geometrical problems, that the roots of equations are possible, and yet the schemes to which they relate may exhibit them impossible, upon the account of some limitation or other in the problem which does not enter the equation. An instance or two will clear up this matter.

Let A B C (plate LIII. *fig.* 5.) be a circle whose diameter is A C, and let A B be any chord inscribed in it; from B, the end of the chord, draw the line B D perpendicular to the diameter A C; and let it be required, having given the lines A B and A C, to compute A D, the segment of the diameter intercepted between the point A and D the foot of the perpendicular. Join B C, and call A D x: then will the similar triangles A D B and A B C give the following proportion, viz. AC is to AB as AB is to AD or x; whence $x=\frac{AB^2}{AC}$; therefore x, the root of this equation, will be equally possible, whether A B be greater or less than A C; but the problem will not be possible unless the chord A B be less than the diameter A C. Here then we have an instance of a problem's producing an equation whose root continues to be possible, even when the problem ceases to be so, on account of the limitation abovementioned, to wit, that in the problem, A B must be less than A C. To explain this mystery, let A C and A B be any two given lines, and let it be required to assign a third proportional to them, which we will call x: since then A C is to A B as A B is to x, we have again $x=\frac{AB^2}{AC}$: but this problem is as unlimited as the equation it produces; for it is certain the two quantities A C and A B will admit of a third proportional, whether A B be greater or less than A C. The case then stands thus: here is an equation arising from a limited problem; but this equation is also intended to solve another problem that is absolutely unlimited; therefore it ought not to be expected that the equation should be liable to any restriction, whatever may be the case of the problem that produced it.

Of the transformation of EQUATIONS.

In order to fit and prepare equations for a more easy resolution, it will be proper that the analyst be well acquainted with all the various ways of transforming equations one into another, most whereof he will meet with in the following articles:

1st. When there are fractions in any equation, they must be taken away after the same manner as in simple equations, to wit, by multiplying the whole equation into all the denominators successively: and if after this, the highest power of the unknown quantity is affected with any coefficient but unity, that coefficient must also be taken off in the following manner: let the equation, when reduced to integral terms, be $ax^3+bxx+cx-d=0$, where the coefficient of the highest power of the unknown quantity is a; then assuming any indeterminate quantity, as y, make $\frac{y}{a}=x$, and substituting $\frac{y}{a}$ in-

ſtead of x in the equation, it will ſtand thus, $\frac{y^3}{aa}+\frac{byy}{aa}+\frac{cy}{a}-d=0$; multiply the whole equation by aa, and you will then have an equation wherein the coefficient of the higheſt power of the unknown quantity is unity, to wit, $y^3+byy+acy-aad=0$; and when, by the reſolution of this equation, the value of y is diſcovered, that of $\frac{y}{a}$ or x, the root of the primitive equation, will alſo be known. Since then every equation may be reduced to another, wherein the coefficient of the higheſt power of the unknown quantity is unity, I ſhall hereafter conſider all equations in that form.

2dly. After the ſame manner may ſurd quantities be ſometimes alſo thrown out of an equation. As for inſtance, let the equation be $x^3*+qx-\sqrt{r}=0$. Now, to get rid of the ſurd quantity $\sqrt{r}$, ſubſtitute $\frac{y}{\sqrt{r}}$ inſtead of x in the equation, and it will ſtand thus, $\frac{y^3}{r\sqrt{r}}*+\frac{qy}{\sqrt{r}}-\sqrt{r}=0$; multiply the whole equation by $r\sqrt{r}$, and you will have $y^3*+qry-rr=0$; and when in this equation the value of y is known, that of $\frac{y}{\sqrt{r}}$ or x will alſo be known.

3dly. Thus alſo may the roots of any equation be multiplied or divided by any given number whatever. As for inſtance, let the equation be $x^3+qx-r=0$, and let it be required to multiply the roots of this equation by 3; that is, let it be required to find an equation whoſe roots ſhall be triple of the roots of this, each of each; and it may be thus done: becauſe 3 is the multiplicator, make $3x=y$, and then ſubſtituting $\frac{y}{3}$ inſtead of x in the equation, you will have $\frac{y^3}{27}+\frac{qy}{3}-r=0$; multiply all by 27, and you will have $y^3+9qy-27r=0$. In like manner may the roots of an equation be divided by 3 when occaſion requires it, to wit, by making $\frac{x}{3}=y$, and ſo ſubſtituting $3y$ inſtead of x in the equation. *Sanderſon's Algebra.*

Cubic EQUATIONS. See CUBIC *Equations.*

Quadratic EQUATIONS. See QUADRATIC *Equations.*

Conſtruction of EQUATIONS. See CONSTRUCTION *of Equations.*

EQUATION *Tranſcendental.* See TRANSCENDENTAL *Equation.*

Exponential EQUATION. See EXPONENTIAL *Equation.*

EQUATION *of a Curve.* See CURVE.

Annual EQUATION *of the Sun, Moon, &c.* See SUN, MOON, &c.

EQUATION *of Time*, in aſtronomy, the reduction of the apparent time or motion of the ſun to equable, mean, or true time. Becauſe we know no body in nature which preſerves conſtantly a perfect uniform motion; and yet ſuch a motion is only proper to meaſure equal days and hours; it is convenient to imagine ſome body or ſtar which moves in the equator eaſtward, and which never quickens or ſlackens its pace, but goes through the equator in preciſely the ſame time as the ſun finiſhes his period in the ecliptic. The motion of ſuch a ſtar will rightly repreſent equal time, and its diurnal motion in the equator will be daily 59′ 8″, the ſame as is the mean motion of the ſun in the ecliptic: and therefore the equal and middle day is to be determined by the arrival of this ſtar to the meridian, and is equal to the time in which the whole circumference of the equator or 360 degrees paſs the meridian; and beſides that 59′ 8″: and becauſe this addition of 59′ 8″ always remains the ſame, all theſe mean days will be conſtantly equal to each other.

Since the ſun goes unequally eaſtward according to the equator, ſometimes it will come to the meridian ſooner than this imaginary ſtar, and ſometimes he will touch it later than it does, and the difference is that which is between the true and apparent time. And this difference is known by having the place of the imaginary ſtar in the equator, and the point of the equator which comes to the meridian with the ſun; for the arch intercepted between them being converted into time, ſhews the difference between equal and apparent time, which is called the equation of time. And it is the time that flows, while the arch of the equator intercepted between the point determining the right-aſcenſion of the ſun, and the place of the imaginary ſtar paſſes the meridian.

Let ÆQ (Plate LIII. *fig.* 6.) be a portion of the equinoctial, E C of the ecliptic, in which imagine S to be the place of the ſun, S A a circle of declination paſſing through the ſun, and meeting with the equator in A, which will be the point which comes to the meridian with the ſun. Suppoſe m to be the place of the imaginary ſtar which performs its period in the equator with an equal motion: and when the ſun has arrived at the meridian our imaginary ſtar will be diſtant from it, by the arch mA; and if the point m be eaſtward of the point A, it will come later to the meridian than it, and the apparent time will be faſter than the mean; but if the place of the ſtar m be more weſterly than A, it will ſooner arrive at the meridian, and the apparent time is ſlower than the mean. And the arch of the equator A m converted into time is the equation, which being added to, or ſubſtracted from the apparent time gives the true, according to the point m is to the eaſt or weſt of the point A; and then we have the true time. For to know the poſition of the point A in reſpect of m, and the quantity of the arch A m, take in the equator the arch ♈ s or ♎ s equal to the ♈ S or ♎ S in the ecliptic; and then the

the arch $s\,m$ will be the distance between the true and mean place of the sun, which therefore is given by the sun's anomaly; but the arch A S is the difference between the hypothenusa ♈ S of the right-angled triangle ♈ S A, and its side or base ♈ A, which may be found by trigonometry. Moreover, the arch A m is equal to either the sum or difference of the arches A s and $s\,m$; and therefore when they are known, the arch A m will be likewise known.

Moreover we must observe, that in the first and third quadrant of the ecliptic, the point s falls upon the east-side of the point A: and therefore the arch A s being turned into time, is to be substracted; because the point S comes later to the meridian than the point A does. But in the second and fourth quadrants the point s is more westerly than A, and arrives at the meridian before it: and therefore the arch A s turned into time is to be added, for to get the time when the point S arrives at the meridian. Suppose for example A s be two degrees, as it is when the sun is in the 20th degree of ♈; this arch turned into time is 8 minutes: and therefore we must add 8′ to the apparent time, for to have the time when the point S comes to the meridian.

Moreover in the first semicircle of anomaly, that is, while the sun in this present age goes from the seventh degree of ♎ to the seventh of ♑, the mean motion of the sun is greater than its true motion; therefore then the middle place precedes the true place. And therefore in all that semicircle the point m will be to the east of the point s; and the arch $m\,s$ turned into time, is to be substracted from the time that the point S reaches the meridian: but in the other semicircle of anomaly, after the sun has left the perigæon, or rather the earth the perihelion, the mean motion is less than the true, and then the mean place follows the true; and consequently the point m is to the west of the point S, and comes sooner to the meridian than it does: and therefore the arch $m\,s$ turned into time, is to be added to the time in which S touches the meridian. Having now the distance of time between the coming of the point m to the meridian, and the coming of the point S to the same; as also the distance of time between the arrivals of the points s and A to the meridian, we shall have the distance of time between the coming of the point m to the meridian, and of the point A's arrival to the same; that is, we shall have the difference between the apparent and true time, which is the equation of time.

For the equating of time the astronomers compose two tables, one for the arch $s\,m$, which is to be entered into with the anomaly of the sun: and if the point m be westward of the point s, they mark it with + or the sign of addition; but if it be on the other side, they place — or of substraction. The other table is for the arch s A, which is the difference between the place of the sun in the ecliptic and his right-ascension. And the equations of this table are likewise marked with the signs of addition or substraction, as the point s is to the west or east of the point A. The sum of these two equations, if they be of the same kind, that is, both to be added or both to be substracted; or their difference, if their affections be of different kinds, make up the absolute equation of time.

TABLE I.

The First Part of the EQUATION OF TIME.

ARGUMENT. The Sun's mean Anomaly.

Subtract from the apparent Time.

S.	O.			I.			II.			III.			IV.			V.			
o.	′	″	diff.	′	″	diff.	′	″	diff.	′	″	diff.	′	″	diff.	′	″	diff.	
0		0,0	7,9	3	46,3	6,8	6	34,9	4,0	7	40,8	0,1	6	43,3	4,0	3	54,6	7,1	30
1		7,9	7,9	3	53,1	6,8	6	38,9	3,9	7	40,9	0,1	6	39,3	4,2	3	47,5	7,1	29
2		15,8	7,9	3	59,9	6,7	6	42,8	3,8	7	40,8	0,2	6	35,1	4,3	3	40,4	7,2	28
3		23,7	7,8	4	6,6	6,6	6	46,6	3,7	7	40,6	0,3	6	30,8	4,4	3	33,2	7,3	27
4		31,5	7,8	4	13,2	6,6	6	50,3	3,6	7	40,3	0,5	6	26,4	4,5	3	25,9	7,4	26
5		39,3	7,8	4	19,8	6,5	6	53,9	3,4	7	39,8	0,6	6	21,9	4,6	3	18,5	7,4	25
6		47,1	7,9	4	26,3	6,4	6	52,3	3,3	7	39,2	0,7	6	17,3	4,7	3	11,1	7,5	24
7		55,0	7,8	4	32,7	6,4	7	0,9	3,2	7	38,5	0,9	6	12,6	4,8	3	3,6	7,6	23
8	1	2,8	7,8	4	39,1	6,2	7	3,8	3,1	7	37,6	1,0	6	7,8	4,9	2	56,0	7,6	22
9	1	10,6	7,8	4	45,3	6,2	7	6,9	3,0	7	36,6	1,2	6	2,9	5,1	2	48,4	7,6	21
10	1	18,4	7,8	4	51,5	6,1	7	9,9	2,8	7	35,4	1,3	5	57,8	5,2	2	40,8	7,7	20
11	1	26,2	7,7	4	57,6	6,0	7	12,7	2,7	7	34,1	1,5	5	52,6	5,3	2	33,1	7,8	19
12	1	33,9	7,7	5	3,6	5,9	7	15,4	2,5	7	32,6	1,6	5	47,3	5,4	2	25,3	7,8	18
13	1	41,6	7,6	5	9,5	5,8	7	17,9	2,4	7	31,0	1,7	5	41,9	5,6	2	17,5	7,9	17
14	1	49,2	7,6	5	15,3	5,7	7	20,3	2,3	7	29,3	1,8	5	36,3	5,7	2	9,6	7,9	16
15	1	56,8	7,6	5	21,0	5,6	7	22,6	2,2	7	27,5	2,0	5	30,6	5,7	2	1,7	7,9	15
16	2	4,4	7,6	5	26,6	5,5	7	24,8	2,0	7	25,5	2,1	5	24,9	5,8	1	53,8	8,0	14
17	2	12,0	7,6	5	32,1	5,5	7	26,8	1,9	7	23,4	2,3	5	19,1	5,9	1	45,8	8,0	13
18	2	19,6	7,5	5	37,6	5,4	7	28,7	1,8	7	21,1	2,5	5	13,2	6,0	1	37,8	8,0	12
19	2	27,1	7,5	5	43,0	5,3	7	30,5	1,6	7	18,6	2,6	5	7,2	6,2	1	29,8	8,1	11
20	2	34,6	7,4	5	48,3	5,1	7	32,1	1,4	7	16,0	2,7	5	1,0	6,2	1	21,7	8,1	10
21	2	42,0	7,3	5	53,4	5,0	7	33,5	1,3	7	13,3	2,8	4	54,8	6,3	1	13,6	8,1	9
22	2	49,3	7,3	5	58,4	5,0	7	34,8	1,2	7	10,5	2,9	4	48,5	6,4	1	5,5	8,2	8
23	2	56,6	7,3	6	3,4	4,8	7	36,0	1,1	7	7,6	3,1	4	42,1	6,6		57,3	8,1	7
24	3	3,9	7,3	6	8,2	4,7	7	37,1	1,0	7	4,5	3,2	4	35,5	6,6		49,2	8,2	6
25	3	11,1	7,2	6	12,9	4,6	7	38,1	0,9	7	1,3	3,3	4	28,9	6,7		41,0	8,2	5
26	3	18,3	7,2	6	17,5	4,5	7	39,0	0,7	6	58,0	3,5	4	22,2	6,8		32,8	8,2	4
27	3	25,4	7,1	6	22,0	4,4	7	39,7	0,5	6	54,5	3,6	4	15,4	6,9		24,6	8,2	3
28	3	32,4	7,0	6	26,4	4,3	7	40,2	0,4	6	50,9	3,7	4	8,5	6,9		16,4	8,2	2
29	3	39,4	7,0	6	30,7	4,2	7	40,6	0,2	6	47,2	3,9	4	1,6	7,0		8,2	8,2	1
30	3	46,3	6,9	6	34,9		7	40,8		6	43,3		3	54,6			0,0		0
S.	XI.			X.			IX.			VIII.			VII.			VI.			o.

Add to the apparent Time.

This Part of the Equation of Time, is the Equation of the Sun's Center turned into Time.

TABLE II.

That Part of the Equation of Time arising from the Obliquity of the Ecliptic.

Subtract from the apparent Time.								
☉ in D.	♈ ♎ ′ ″	diff.	♉ ♌ ′ ″	diff.	♊ ♐ ′ ″	diff.	—
0	0. 00	″	8. 23	″	8. 45	″	30
		20		10		10	
1	0. 20		8. 33	10	8. 35	11	29
		20				12	
2	0. 40		8. 43	9	8. 24		28
		19				12	
3	0. 59		8. 52	9	8. 12		27
		20				13	
4	1. 19		9. 1	8	8. 00		26
		20				13	
5	1. 39		9. 9	8	7. 47		25
		19				14	
6	1. 58		9. 17	7	7. 34		24
		20				15	
7	2. 18		9. 24	6	7. 20		23
		19				15	
8	2. 37		9. 30	5	7. 5		22
		19				16	
9	2. 56		9. 35	5	6. 50		21
		19				16	
10	3. 15		9. 40	4	6. 34		20
		19				17	
11	3. 34		9. 44	3	6. 18		19
		18				17	
12	3. 52		9. 47	3	6. 1		18
		18				18	
13	4. 10		9. 50	2	5. 44		17
		18				18	
14	4. 28		9. 52	1	5. 26		16
		18				18	
15	4. 46		9. 53	1	5. 8		15
		17				19	
16	5. 3		9. 54	0	4. 50		14
		17				20	
17	5. 20		9. 54	1	4. 31		13
		17				19	
18	5. 37		9. 53	2	4. 11		12
		16				20	
19	5. 53		9. 51	2	3. 52		11
		16				21	
20	6. 9		9. 49	3	3. 32		10
		16				20	
21	6. 25		9. 46	4	3. 11		9
		15				21	
22	6. 40		9. 42	5	2. 51		8
		14				21	
23	6. 54		9. 37	5	2. 30		7
		14				21	
24	7. 8		9. 32	6	2. 9		6
		14				22	
25	7. 22		9. 26	7	1. 48		5
		13				21	
26	7. 35		9. 19	7	1. 26		4
		13				22	
27	7. 48		9. 12	8	1. 5		3
		12				21	
28	8. 00		9. 4	9	0. 43		2
		12				22	
29	8. 12		8. 55	10	0. 22		1
		11				21	
30	8. 23		8. 45		0. 00		0
☉ in	♌ ♍		♎ ♏		♑ ♒		
Add to the apparent Time.							

The artifts likewife make a table compofed of both the former; but it will only ferve for a time: yet it may be ufed for a whole age without any fenfible error; for the fame degree of anomaly keeps nearly in the fame degree of the ecliptic the fpace of an age: and therefore for the fpace of 50 years thefe two equations may be joined in one. But becaufe of the preceffion of the equinoxes, the fun's apogæon in procefs of time changes its place in the ecliptic, and goes eaftcrly with the fixed ftars: and therefore in different ages the fame degrees of anomaly will fall upon different degrees of the ecliptic: and therefore one table will not ferve for all ages.

In the prefent age wherein we live, when the fun is in the 10th degree of Scorpio, the point A is at its fartheft diftance from m to the weft of it; and its diftance then amounts to 4° 2′ 45″, and therefore the greateft equation in time is 16′ 11″. From thence the days begin to increafe, till the fun comes to 22½ degree of Aquarius, where it has gone to its fartheft diftance from m eaftward, it being there removed 3 degrees 42½ minutes; whence the greateft equation of time is 14′ 50″: and from thence the relative motion of the point A begins again to be weftward, till the fun comes to the 24th degree of Taurus or the Bull; and there the point A is removed from m 1 degree 1½ minute to the weft of the ftar m, and the greateft equation of time is 4′ 6″. Thence it returns again to m, and moves eafterly, till the fun comes into the 3½ degrees of the Lion, where A is diftant from m 1 degree 28½ minutes, and the greateft equation of time is 5′ 53″: and from thence its motion begins to be to the weft, till the fun arrives at the 10th of the Scorpion; and thereabouts it changes its courfe and goes eaftward. It is plain, that when the points A and m coincide, that there the mean and apparent time muft likewife coincide. Hence if we have a pendulum clock accurately and nicely fitted, and the motion of the hand fet to equal or true time, the hand of this clock will always point out the time different from the folar time fhewed by a fun-dial; except four times a year, which is about the 4th of April, the 6th of June, the 20th of Auguft, and the 13th of December. At all other times the hour by the fun-dial will either be before or later than that fhewed by the hand of the clock: and about the 23d of October the clock will differ moft of all from the fun, where its motion is flower than the folar time by 16′ 11″.

If you inquire in what points the equations are the greateft, the eminent Dr. Edmund Halley, who for his great inventions is never to be mentioned by aftronomers without honour, has given us the folution of this problem. But to underftand it we muft firft lay down the following lemma.

LEMMA.

If any plain figure be projected orthographically on a plane; which is done by letting fall from every point of it perpendiculars on the plane of projection; the area of that projection of the figure will be to the figure projected, as the co-fine of the inclination of the planes is to the radius.

For any figure can always be refolved into parallelograms or triangles, whofe bafes are parallel to the common fection of the planes; and therefore they will be parallel to the plane on which they are projected: wherefore the bafes of thefe parallelograms or triangles, and their projections on the plane, are always equal to each other, and parallel. But the perpendiculars let fall from the fummits or tops of the triangles and parallelograms upon the bafes,

baſes, are alſo perpendicular to the common ſection of the planes, by the 29th to the firſt el. And therefore the inclination of the perpendiculars to the plane is equal to the inclination of the planesto each other. And conſequently the projections of theſe perpendiculars will be to the perpendiculars themſelves, as the co-ſine of the inclination of the plane is to the radius. Wherefore every parallelogram or triangle is projected into another, whoſe baſe is equal to the baſe of the triangle or parallelogram projected; and its height is to the height of the figure projected as the co-ſine of the inclination of the planes is to the radius. But triangles and parallelograms whoſe baſes are equal are as the perpendiculars let fall from the tops upon the baſes. The projection therefore of each triangle is to the triangle projected in a conſtant and given proportion; conſequently all the projections of all the triangles or parallelograms are to the figures projected in the ſame proportion; that is, the projection is to the figure projected as the co-ſine of the inclination is to the radius.

If the orbit of the earth be orthographically projected on the plane of the equator, by letting fall from each of its points perpendiculars, the projection will be an ellipſe, in whoſe perimeter the extremity of a right line let fall from the earth, perpendicular to the plane of the equator, will conſtantly move: and this point by its motion will mark out the right aſcenſion of the earth, or its motion according to the equator, as it is to be ſeen from the ſun; to which the right aſcenſion of the ſun ſeen from the earth is always equal. Let ♈ A ♎ C (*fig.* 7.) be the ellipſe in which the orbit of the earth is projected, S the point of projection of the ſun's center, ♈ S ♎ the common interſection of the equator and the ecliptic, A any point, where a perpendicular from the earth meets with the projection: the angle ♈ S A will meaſure the right aſcenſion of the ſun. Now I ſay, that this point A which marks out the motion of right aſcenſion, will ſo proceed in the ellipſe ♈ A ♎ C, that it will deſcribe about the point S elliptic areas proportional to the times. For in a given time let A move through the elliptic arch A B; draw the lines A S and B S; and the trilineal figure A S B will be the projection of the correſpondent area which the earth deſcribes in the plane of the ecliptic, in the ſame time, round the ſun: and therefore the projection A S B will be to the correſpondent area in the earth's elliptic orbit, as the co-ſine of the inclination of the equator and the ecliptic is to the radius. But in the ſame proportion is the whole elliptic area ♈ A ♎ C to the whole area of the earth's orbit: therefore by permutation of proportion, the trilineal figure A S B will be to the whole elliptic area ♈ A ♎ C, as the area deſcribed in the earth's orbit round the ſun is the whole area of the earth's orbit; that is, as the time in which that area in the orbit of the earth, or the area A S B in the projection, as deſcribed, is to the whole periodical time. Therefore the point A moves in the perimeter of the ellipſe at ſuch a rate, that it deſcribes about S area's that are continually proportional to the times.

The ſame things being laid down; at the center S and diſtance S A, which is a mean proportional between half the greater and half the leſſer axis of the ellipſe, deſcribe a circle; this circle will be equal to the whole elliptic area; as it is eaſy to demonſtrate from the doctrine of the conick ſections; this circle will cut the ellipſis in four points E, F, G, H, (*fig.* 8.) the points of interſection ſhew the right aſcenſions of the ſun, where the equations are greateſt. Imagine a point M to move uniformly in the periphery of the circle; its motion will then repreſent the motion of our imaginary ſtar *m*, and will deſcribe about the point S circular ſectors that are proportional to the time: and becauſe the area of the whole circle and the area of the ellipſe are equal, the areas of the elliptic ſectors and of the circular ſectors, deſcribed in the ſame time, will be conſtantly equal. Let us now ſuppoſe that the point M in the periphery of the circle, and the point that marks out the ſun's right aſcenſion in the ellipſe, be placed at the ſame time both in the right-line S L M. Let theſe points afterwards be in *m* and A, then the elliptic area L S A will be equal to the circular ſector M S *m*: and becauſe the arch M *m* is without the ellipſe, the angle M S *m* will be leſs than the angle M S A, and the difference of the angles meaſured by the arch *m* A, which is the equation of time. When the point which marks out the right aſcenſion of the ſun comes to the interſection F of the circle and ellipſe, there its angular motion round the ſun will be equal to the angular motion of the point *m*; for the areas *m* S *n* and A S F are equal, they being both deſcribed in the ſame moment of time, and at the ſame diſtance from S; and conſequently the arch *q* F is equal to the arch *m n*. In the point therefore F, the motion of right aſcenſion is equal to the motion of the imaginary ſtar, or equal to the mean motion. The ſame thing may be ſhewed at G, H and E: but it was ſhewed before, that where the motion of right aſcenſion was equal to the motion of the point *m*, that there the equations are greateſt. Wherefore in the points F, G, H and E, are the equations greateſt.

EQUATOR, in geography, a great circle of the terreſtrial globe, equidiſtant from its poles, and dividing it into two equal hemiſpheres; one north, and the other ſouth. See the article GLOBE.

It paſſes through the eaſt and weſt points of the horizon, and at the meridian is raiſed as much above the horizon as is the complement of the latitude of the place. From this circle, the latitude of places, whether north or ſouth, begin to be reckoned, in degrees of the meridian. See LATITUDE and MERIDIAN.

All

All people living on this circle, called by geographers and navigators the line, have their days and nights conſtantly equal.

It is in degrees of the equator that the longitude of places are reckoned; and as the natural day is meaſured by one revolution of the equator, it follows that one hour anſwers to $\frac{360}{24} = 15$ degrees: hence one degree of the equator will contain four minutes of time, fifteen minutes of degree will make a minute of an hour; and, conſequently, four ſeconds anſwer to one minute of a degree.

EQUERRY, in the Britiſh cuſtoms, an officer of ſtate, under the maſter of the horſe.

There are five equerries, who ride abroad with his majeſty; for which purpoſe they give their attendance monthly, one at a time, and are allowed a table.

As to the equerries of the crown ſtable, they have this diſtinct appellation, as being employed in mounting, managing, and breaking the ſaddle-horſes for his majeſty's uſe, and holding his ſtirrup.

EQUESTRIAN STATUE ſignifies the ſtatue of a perſon mounted on horſeback.

EQUESTRIAN ORDER, among the Romans, ſignified their knights, or equites; as alſo their troopers, or horſemen in the field; the firſt of which orders ſtood in contradiſtinction to the ſenators, as the laſt did to the foot, military, or infantry: each of theſe diſtinctions was introduced into the ſtate by Romulus.

EQUIANGULAR, in geometry, an epithet given to figures whoſe angles are all equal: ſuch are a ſquare, an equilateral triangle, &c.

EQUICRURAL, in geometry, the ſame with iſoſceles. See the article ISOSCELES.

EQUICULUS, or EQUULEUS. See the article EQUULEUS.

EQUIDIFFERENT NUMBERS, in arithmetic, are of two kinds, 1. Continually equidifferent is when, in a ſeries of three numbers, there is the ſame difference between the firſt and ſecond, as there is between the ſecond and third; as 3, 6, 9. And, 2. Diſcretely equi-different, is when in a ſeries of four numbers or quantities, there is the ſame difference between the firſt and ſecond, as there is between the third and fourth: ſuch are 3, 6, 7, 10.

EQUIDISTANT, an appellation given to things placed at equal diſtance from ſome fixed point, or place, to which they are referred.

EQUILATERAL, in general, ſomething that hath equal ſides, as an equilateral angle.

EQUILATERAL HYPERBOLA, one whoſe tranſverſe diameter is equal to its parameter, and ſo all the other diameters equal to their parameters: in ſuch an hyperbola, the aſymptotes always cut one another at right-angles in the center. Its moſt ſimple equation, with regard to the tranſverſe axis, is $y^2 = x^2 - a^2$; and, with regard to the conjugate, $y^2 = x^2 + a^2$, when a is the ſemi-tranſverſe, or ſemi-conjugate. The length of the curve cannot be found by means of the quadrature of any ſpace, of which a conic ſection is any part of the perimeter. See the article HYPERBOLA.

EQUILIBRIUM, in mechanics, is when the two ends of a lever or balance hang ſo exactly even and level, that neither doth aſcend or deſcend, but keep in a poſition parallel to the horizon; which is occaſioned by their both being charged with an equal weight.

EQUIMULTIPLES, in arithmetic and geometry, are numbers or quantities multiplied by one and the ſame number or quantity. Hence, equimultiples are always in the ſame ratio to each other, as the ſimple quantities before multiplication: thus, if 6 and 8 are multiplied by 4, the equimultiples 24 and 32 will be to each other as 6 to 8.

EQUINOCTIAL, in aſtronomy, a great circle of the celeſtial globe, whoſe poles are the poles of the world.

It is ſo called, becauſe whenever the ſun comes to this circle, the days and nights are equal all over the globe; being the ſame with that which the ſun ſeems to deſcribe at the time of the two equinoxes of ſpring and autumn. See the article EQUINOX.

All ſtars, directly under this circle, have no declination, and always riſe due eaſt, and ſet full weſt. The hour circles are drawn at right angles to it, paſſing through every fifteenth degree; and the parallels to it are called parallels of declination. See the articles DECLINATION and CIRCLE.

EQUINOCTIAL *Colure*. See COLURE.

EQUINOCTIAL *Dial*. See DIAL.

EQUINOCTIAL *Hour*. See HOUR.

EQUINOCTIAL *Line*. See LINE.

EQUINOCTIAL *Occident*. See OCCIDENT.

EQUINOCTIAL *Orient*. See ORIENT.

EQUINOCTIAL *Point*, *&c.* See POINT, &c.

EQUINOX, the time when the ſun enters either of the equinoctial points, where the ecliptic interſects the equinoctial. See the preceding article.

It is ſo called, becauſe when the ſun is in theſe points, the days and nights are of an equal length all the world over. As the ſun is in one of them, in the ſpring, viz. March 20, it is called the vernal equinox; and in the other, in autumn, viz. September 23, it is called the autumnal equinox.

Preceſſion of the EQUINOXES. See the article PRECESSION.

EQUIPOLLENCE, in logic, is when there is an equivalence, or agreement, either as to the nature of things, or as to the grammatical ſenſe of any two propoſitions; that is, when two propoſitions ſignify one and the ſame thing, though they expreſs it after different manners.

EQUISETUM, horſetail, in botany, a genus of cryptogamious plants, of the order of the felices, or ferns, the fructifications of which are diſpoſed on an oblong ſpike, and are of an orbicular figure, di-

ditches,

viding into various angles from the base. The plant itself grows in shady woods, and on the sides of ditches, in several parts of England; and consists of jointed stalks, in some species simple, in others branched, producing setæ, or small divisions, of the same structure of the larger ones. Horsetail is accounted vulnerary and astringent, and therefore prescribed in hæmorrhages, and injuries of the kidneys and bladder.

EQUITY, in a general sense, the virtue of treating all other men according to common reason and justice, or as we would be gladly treated ourselves, when we understand aright what is our due. See the article JUSTICE.

EQUITY *of Redemption*, in our law, is applied to mortgages, as where money being due on a mortgage, the mortgagee is desirous to bar the mortgager's equity of redemption, that is, his right to redeem the mortgage. In this case the mortgagee may oblige the mortgager, either to pay the money, or to be foreclosed of his equity of redemption. The practice is to exhibit a bill, to which answer being put in, and a decree obtained, a master of that court certifies what is due for principal, interest, and costs, which is to be paid within the time limited by the decree; and thereupon, the estate mortgaged is to be reconveyed to the mortgager, otherwise, for default of payment, the mortgager is decreed to be foreclosed from all equity of redemption, and absolutely to convey the mortgaged premises to the mortgagee. See MORTGAGE.

EQUITY also frequently signifies the court of chancery, where controversies are determined according to the exact rules of equity and conscience, by mitigating the rigour of the common law; though even by the common and statute law there is also an equity. See the article CHANCERY.

EQUIVALENT, an appellation given to things which agree in nature, or other circumstances, as force, nature, &c.

EQUIVOCAL TERMS, or *Words*, among logicians, are those which have a doubtful, or double meaning.

According to Mr. Locke, the doubtfulness and uncertainty of words has its cause more in the ideas themselves, than in any incapacity of the words to signify them; and might be avoided, would people always use the same term to denote the same idea, or collection of ideas: but, adds that great man, it is hard to find a discourse on any subject where this is the case; a practice which can only be imputed to folly, or great dishonesty; since a man, in making up his accompts, might, with as much fairness, use the numerical character sometimes for one, sometimes for another collection of unities.

EQUIVOCAL ACTION is, where the effect is of a different kind from the cause producing it.

EQUIVOCAL CAUSE. See CAUSE.

EQUIVOCAL GENERATION, the production of animals, without the intercourse between the sexes, by the influence of the sun or stars, &c.

The equivocal generation of plants, is their production without seed, in the ordinary course of nature. See the article GENERATION.

This kind of generation is now quite exploded by the learned.

EQUIVOCATION, in ethics, the crime of wilfully using equivocal terms.

EQUULEUS, or ECUULEUS, in antiquity, a kind of rack used for extorting a confession, at first chiefly practised on slaves, but afterwards made use of against the christians.

The equuleus was made of wood, having holes at certain distances, with a screw, by which the criminal was stretched to the third, sometimes to the fourth, or fifth holes, his arms and legs being fastened on the equuleus with cords: and thus was hoisted aloft, and extended in such a manner, that all his bones were dislocated. In this state red-hot plates were applied to his body, and he was goaded in the sides with an instrument called ungula.

EQUULEI, or EQUICULUS, the little horse. historians are not well agreed how this constellation obtained its name or place amongst the others, nor can it be said with certainty that it was any other than the famous Paculett, so often mentioned in the renowned history of the Seven Champions, who, after performing such great actions, was by Jupiter, at the request of St. George, and the fair Sabra, translated to the heavens, and made a constellation, containing, according to the following calculation, 10 stars, whose right ascension, declination, and variation is there settled for the year 1770.

Order.	Mag.	Name.	Bayer Let.	Right Ascension	Distance from Nor. Pole.	Var. in Right Ascen.	Var. in Declination
				° ′ ″	° ′ ″	″	″
1	5			311.33. 0	86.36.53	43.2	14.2
2	6			312.35. 3	83.45. 5	43.1	14.2
3	6			313. 8.41	85.26.18	43.0	14.0
4	6			313 22.51	84.58.29	43.1	14.1
5	4		γ	314.39.30	80.49.21	43.5	14.1
6	6			314.42. 6	80.55.11	43.2	14.2
7	4		δ	315.41. 3	80.56. 3	43.5	14.3
8	4		α	316. 3.54	85.46 17	45.9	14.4
9	6			317.17.37	83.39.16	43.2	14 6
10	4		β	317.44 26	84.12.25	44.5	14.8

EQUUS, the HORSE, in zoology. See HORSE.

EQUUS MARINUS, in ichthyology, the same with the morse. See MORSE.

ERASED, in heraldry, the same with arrache. See the article ARRACHE.

ERECT FLOWERS, such as grow upright without hanging or reclining the head. See the article FLOWER.

ERECT DIAL. See the article DIAL.

ERECT VISION. See the article VISION.

ERECTOR CLITORIS, in anatomy, one of the two muſcles of the clitoris that ſerve for its erection.

The erectores of the clitoris ariſe from the oſſa iſchii, and are inſerted into the corpora cavernoſa.

ERECTOR PENIS, one of the two muſcles of the penis, that ſerve for its erection.

Theſe ariſe on each ſide, from the oſſa iſchii between the tubercle of this bone and the beginning of the corpus cavernoſum, and each of them is inſerted into the corpus cavernoſum of its own ſide. Theſe muſcles, when they act together, preſs the veins of the back of the penis againſt the oſſa pubis, by which they prevent the reflux of blood from the penis; and conſequently, when at the ſame time the blood flows impetuouſly into the parts by the arteries, and cannot get back this way, the penis becomes erected.

ERICA, heath, in botany, a genus of plants, whoſe flower conſiſts of a monapetalous campanulated corolla, containing eight capillary filaments topped with bifid antheræ; the fruit is a roundiſh quadrilocular capſule containing a great number of very ſmall ſeeds. Theſe plants grow wild upon barren and uncultivated places in ſeveral parts of England, and are much uſed for brooms, as the pliableneſs of the branches, which are alſo tough and fine, makes them very fit for that purpoſe. The diſtilled waters of heath flowers is by ſome recommended for ſore eyes, as alſo for the cholic; and fomentations of them are ſaid to be good in the gout and paralytic diſorders.

ERIDANUS, or FLUMEN, in aſtronomy, a conſtellation of the ſouthern hemiſphere, which was originally ſuppoſed to be the Nile, though the Romans turned it into Eridanus: and it is repreſented on the globe to wander ſeveral different rays. It runs up north to one of the Piſces, and according to the ancient Farneſe globe, ſhould certainly go to the other, and by Andromeda's head; but the line in that part is defaced by time, or ſome accident or other.

Its chief courſe is by the Sea-monſter, from which it goes to Orion's legs in one ſtream; as it falls from it in another very ſerpentine one toward the Antartic-pole: the chief thing to be obſerved is, that it is very irregular and winding.

The fabulous ſtories of the poets concerning this river are various. Some call it Padus, and ſay that it was placed in heaven in remembrance of Phaeton, who ſet fire to the whole world by reaſon of his miſguiding the chariot of his father Phæbus, and was ſlain with a thunder bolt by Jupiter, and tumbling headlong down from heaven fell into the river Eridanus or Padus, which the Italians call Po. Others call it Flumen Orionis, or the flood of Orion, and ſay it was placed there to betoken the offſpring from whence he came: for according to the poets, it is thus reported concerning his birth or origin.

Jupiter, Neptune, and Mercury, once being in a frolickſome humour, travelled together on the earth in the likeneſs of men, and being overtaken with night, were requeſted by one Hyreus, a farmer and grazier, to take a lodging at his houſe: to whoſe requeſt the gods readily yielded. The good old Hyreus, who was of a hoſpitable and friendly diſpoſition, killed an ox, that he might the better entertain his new gueſts, and make them welcome. The gods ſeeing the good heart of the old gentleman and his wife, ordered him to demand whatever he thought proper in recompence for his friendly cheer. Hyreus and his wife being old, requeſted of the gods to gratify them with a ſon. The gods, to fulfill their deſire, called for the hyde of the ox that was ſlain, which being brought, they put it into the earth, and all three of them made water into it together, and then covered it up, and ordered Hyreus to dig it up in nine months afterwards, which he did, and found therein a man child, whom he called Ourion ab Urina, of piſs; though afterwards omitting the ſecond letter he was named Orion. Therefore at the time he was placed in heaven, this flood was joined hard to his heels; and the ox hide, wherein the gods did piſs, was placed in his hand in memorial of his offſpring. The ſtars in this conſtellation are ſixty-nine, whoſe right aſcenſion, declination, &c. are as follow:

Order	Magn.	Name.	Bayer Let.	Right Aſcenſion.	Diſtance from Nor. Pole.	Var. in Right Aſcen.	Var. in Declination.
				° ′ ″	° ′ ″	″	″
1	4	1ma ad	τ	38.27.47	109.35 48	40. 0	15.5
2	4	2da ad	τ	39. 2. 1	112. 0. 2	39. 2	15.4
3	3		γ	41.18. 3	99.49.27	43. 8	15.1
4	6			41.39 41	114.49 58	38. 1	15.0
5	6			41.54.50	93.25.48	43. 1	15.0
6	6			41.49.58	114.34.40	38. 2	15.0
7	6			42.11.18	93.50.31	43. 1	14.9
8	6	1ma ad	ϱ	42.21. 5	98.36.58	42. 0	14.7
9	5	2da ad	ϱ	42.45. 4	98.38.44	42. 0	14.6
10	4	3tia ad	ϱ	43. 8.16	98.33.52	43. 0	14.2
11	3.4			43. 8.48	114.34.32	38. 0	14.1
12	3			45.34.26	119.54.32	37. 9	14.0
13	3		ζ	46. 3.14	99.33.38	43. 4	13.9
14	6			46.14.38	100. 3. 4	41. 4	13.8
15	6			46.55.33	113.22.58	38. 0	13.6
16	4			47.11.55	112.38.42	38. 2	13.2
17	4.5			49 48.12	95.52.45	44. 5	13.0
18	3.4		ε	50.25.40	100.16.55	43. 2	12.7
19	4			50.47.39	112.27.53	38. 0	12.6
20	5.6			51.20.51	108.26.17	39. 0	12.5
21	6			51.47.17	96.24. 4	42. 2	12.3
22	5.6			52.11. 5	95.59.36	42. 2	12.2

Order.	Magn.	Name.	Bayer Let.	Right Aſcenſion.	Diſtance from Nor. Pole.	Var. in Right Aſcen.	Var. in Declination.
				° ′ ″	° ′ ″	″	″
23	3·4		δ	55· 3·44	100 33.32	43· 1	12.0
24	5			53· 4· 1	91·55· 2	43· 2	12.0
25	6			53·10· 5	91· 4·18	43· 3	11.9
26	4		π	53·41.41	102.51.44	40· 2	11.8
27	4			54· 8.38	113·57·24	37· 0	11.7
28	6·5			54.20.26	114·37·37	37· 0	11.6
29	6·7			55· 9·27	96·47·13	44· 2	11.5
30	5·6			55·12.22	96· 5·19	42· 1	11.4
31	5·6			55.26.22	96· 0.34	42· 1	11.3
32	4·5			52.32.39	93·40·42	43· 0	11.2
33	4·5			55·52.18	115·19·45	36· 2	11.1
34	2		γ	56.49.25	104.10.36	41· 9	11.1
35	5			57.20.46	92.14.29	43· 2	10.9
36	4			57.25.59	114.42.24	36· 3	10.6
37	6			59.40· 2	97·33·41	42· 0	10.2
38	3 4		o	60· 2· 5	97.28.42	41· 4	10.0
39	5		A	60.45.18	100.52.50	41· 0	10.0
40	5		d	61· 5 42	77·58.37	42· 0	9.5
41	4·3			62.10.31	124.23.52	32· 2	9.4
42	4·3		ξ	62.56.21	94.18.44	44·50	9.3
43	5			63.41.42	124.33.46	32· 2	9 0
44	5.6			64· 3 19	89.10.23	44· 1	8.9
45	5.6			64·55.28	90·34·42	44· 0	8.6
46	5			65.33.16	97.14.36	42· 0	8.5
47	4			65.39.50	98.45· 8	42· 0	8.3
48	4		ν	66· 4.45	93 49.18	43· 0	8.0
49	5.6			66.11· 5	89.30.37	44· 1	7.9
50	4	1ma ad	υ	65.59.44	120.15· 4	34· 0	7.8
51	4		c	66.22.19	92.58.16	41· 0	7.6
52	3	2da ad	υ	66.32.39	121· 3.40	33· 2	7·5
53	3·4			66.46.33	104 47.· 0	39· 2	7.4
54	3·4			67.29· 2	110· 8.48	37· 2	7·3
55	6			68· 1· 5	99 15.40	41· 0	7.2
56	6			68· 8.13	98·53· 9	41· 1	7.1
57	4		μ	68.22.45	93·42.15	43· 0	7.0
58	5.6			69.16.29	107.23· 4	41· 2	7.0
59	6			69.26.34	106.46· 0	39· 0	6.9
60	6			69.51· 6	106.39.31	39· 0	6.8
61	5		ω	70.16.20	95·52.34	42· 1	6.6
62	6		b	71· 8· 9	95·33.46	42· 1	6.4
63	6			72· 7.22	100.37·53	40· 3	6.3
64	6			72.12· 0	102.54.23	40· 0	6.0
65	5		φ	72.27· 8	97.32.34	41· 3	5 9
66	6			73·23· 1	94·59.41	42· 2	5.6
67	3		b	74· 8.28	95,24· 2	44·33	5·5
68	6			74.12.38	94 44·56	42· 2	5.2
69	4		λ	74·25· 7	95· 4·43	41· 0	5.0

ERIGERON, in botany, a genus of plants producing compound radiated flowers, compoſed of hermaphrodite and female corollulæ; the hermaphrodite are funnel-ſhaped, and cut at the top into five parts, with five hairy ſtamina; the female florets are ligulated, linear, and ſubulated, and compoſe the rays: the fruit has no pericarpium, but the cup, which is connivent, contains the ſeeds, which are oblong, ſmall, and crowned with a long down. This genus includes the conyzoides and conyzella of Dillenius.

ERINUS, in botany, a genus of plants whoſe flower is of the ringent kind, and contains four ſhort didynamious ſtamina. The fruit is an ovate bilocular capſule, covered by the cup, and contains a great number of ſmall ſeeds. This genus includes the ageratum of Tournefort.

ERIOCEPHALUS, in botany, an evergreen plant with a ſhrubby ſtalk, furniſhed with white woolly leaves, which are digitated, and are of a ſtrong ſmell when bruiſed; the flowers, which are compound and radiated, are produced in ſmall cluſters at the extremity of the branches, and are compoſed of hermaphrodite and female corollulæ; the hermaphrodite, which compoſe the diſk, are funnel-ſhaped, and the female ones, being five in number, are ligulated in the radius; the hermaphrodite florets are barren, but each of the female are ſucceeded by a ſingle, roundiſh, naked ſeed, reſting on a plain receptacle.

ERIPHORUM, in botany, a genus of triandrious plants, whoſe flower is deſtitute of a corolla, the calyx is an imbricated ſpike, with oval oblong ſquamæ, the ſeed is triguetrous, ſharp-pointed, and furniſhed with hairs longer than the ſpike.

ERITHALIS, in botany, a genus of plants whoſe flower is monopetalous, and contains five ſubulated filaments, topped with oblong antheræ; the fruit is a globoſe coronated berry, with ten cells, containing a number of ſmall ſeeds.

ERMIN, *Erminium*, in zoology, a creature whoſe ſkin is the ermin, ſo much eſteemed as a fine fur.

This creature is properly a ſpecies of weaſel, and is called by Mr. Ray, and other authors, muſtela candida, the white weaſel, and is in all reſpects like the common weaſel, and is all over of a pure ſnow-white, except the tip of the tail, which is of as beautiful a black; and it has a little yellowiſh grey about the eyes, and a mark, or ſpot, of the ſame colour, on the head, another on the ſhoulders, and a third near the tail. Its colour is, however, very different in degree and elegance, according to the ſeaſon of the year. It is frequent about rivers, and in meadows, in thoſe countries which produce it, and feeds on moles, mice, and other ſmall animals.

ERMIN, in heraldry, is always argent and ſable, that is, a white field, or fur, with black ſpots. Theſe ſpots are not of any determinate number, but may be more or leſs, at the pleaſure of the painter, as the ſkins are thought not to be naturally ſo ſpotted; but ſerving for lining the garments of great perſons, the furriers were wont, in order to add to their beauty, to ſow bits of the black tails of the creatures

creatures that produced them, upon the white of their ſkin, to render them the more conſpicuous, which alteration was introduced into armory.

ERMIN, or EARS OF CORN, an order of knights in France, inſtituted by Francis the laſt of that name, duke of Brittany.

ERMINE', or croſs ermine, is one compoſed of four ermin ſpots.

It is to be obſerved, that the colours in theſe arms, are not to be expreſſed, becauſe neither this croſs, nor theſe arms, can be of any other colour but white and black.

ERMINES are, by ſome Engliſh writers, held to be the reverſe of ermine, that is, white ſpots on a black field, and yet the French uſe no ſuch word, but call this black powdered with white *contre ermin*, which is very proper, as it denotes the reverſe of ermin. See the article ERMIN.

ERMINITES ſhould ſignify little ermines, but it is otherwiſe; for it expreſſes a white field powdered with black, only that every ſuch ſpot hath a little red hair on each.

Erminites alſo ſignify a yellow field powdered with black, which the French expreſs much better by *or ſemée d'ermine de ſable.*

EROSION, among phyſicians, denotes much the ſame with corroſion, only in a ſtranger degree. See the articles CORROSION and CORROSIVES.

ERRATA, a liſt of the errors or faults in the impreſſion of a book, generally placed at the beginning thereof.

ERRATIC, in general, ſomething that wanders, or is not regular: hence it is, the planets are called erratic ſtars; as thoſe fevers, which obſerve no regular periods, are denominated erratic fevers.

ERRHINES, ἑρρινα, in pharmacy, medicines which, when ſnuffed up the noſe, promote a diſcharge of mucus from that part.

The excretion of the mucus lymph is excellently promoted by errhines and ſternutatories, the former of which ſtimulate the pituitary coats but gently, whereas the latter more forcibly ſtimulate them to an excretory motion. See the article STERNUTATORY.

ERROUR, ERROR, in philoſophy, a miſtake of our judgment, giving aſſent to that which is not true.

Mr. Locke reduces the cauſes of error to theſe four; firſt, want of proofs; ſecondly, want of ability to uſe them; and, thirdly, want of will to uſe them; and fourthly, wrong meaſures of probability.

ERUCA ROCKET, in botany, a plant with a white, woody, ſlender, root, and hairy ſtalks. The leaves are pinnated and lacinated. The flowers are cruciform and ſtriped: and the ſeed are roundiſh.

The ſmell of this plant is ſtrong and ungrateful; as is alſo the taſte. It is ſaid to excite the appetite, and help digeſtion, to ſtrengthen the ſtomach, and to promote urine.

This plant is claſſed by Linnæus among the braſſicas or cabbages, which ſee.

ERVUM, bitter vetch, in botany, a genus of plants producing papilionaceous flowers. The vexillum plane, roundiſh and ſlightly reflexed. The alæ are obtuſe, and ſhorter by half than the vexillum: and the carina is ſhorter than the alæ, and acuminated.

The fruit is a thick, knotty, obtuſe and oblong pod, containing four roundiſh ſeeds.

The ground ſeeds of a ſpecies of this genus abounds with a diuretic ſalt, and is therefore recommended for the ſtone.

ERUCTATIONS, in medicine, are the effects of flatulent foods, and the crudities thence ariſing. See FLATULENCY.

ERUDITION, *eruditio*, denotes an extenſive acquaintance with books, eſpecially ſuch as treat of the Belles Lettres.

ERUPTION, in medicine, a ſudden and copious excretion of humours, as pus or blood: it ſignifies alſo the ſame with exanthema, any breaking-out, as the puſtules of the plague, ſmall-pox, meaſles, &c.

ERYNGIUM, ERYNGO, or ſea-holly, in botany, a genus of plants whoſe flowers are placed on one common receptacle. The general corolla is uniform and roundiſh: and the floſcule, which compoſes it, conſiſts each of five oblong petals knotted together by a longitudinal line, including five capillary ſtamina.

The fruit is of an oval figure, divided into two parts, each having one oblong taper ſeed.

The common eryngium grows in plenty on ſandy and gravelly ſhores in ſeveral parts of England; the roots of which are uſed in medicine; and are reckoned hepatic, rephretic and alexipharmic. Their whole virtue conſiſts in the external or cortical parts,

ERYSIMUM, hedge-muſtard, in botany, a genus of plants whoſe flower conſiſts of a tubulous cup, containing four oblong cruciform petals, with very obtuſe points, and ſix ſtamina.

The fruit is a long, linear, four cornered pod, with two cells, filled with ſmall round ſeeds.

The common eryſimum, which is uſed in medicine, grows in great plenty in many parts of England, and flowers in July or Auguſt. It is biting and pungent, not much unlike common muſtard; and in like manner, it is aperient and diſcuſſive. It is preſcribed chiefly in aſthmas, in farctions of the lungs and chronical coughs: for it not only diſſolves the viſcid matter in the lungs, but alſo in the ſtomach and inteſtines; whence it is good in cholics proceeding therefrom. It is alſo ſaid to expel poiſon, deſtroy worms, and cure ulcers in the mouth.

ERYSIPELAS,

ERYSIPELAS, otherwiſe called St. Anthony's fire, is that ſpecies of inflammation, which ariſing in the ſkin, and its ſubjacent fat, ſometimes ſpreads itſelf very far, and is accompanied with redneſs, heat, and pain. The part affected, when preſſed with the finger, becomes remarkably white; but ſoon after its removal, reſumes its former redneſs.

The word is Greek, ερυσιπελας, and derived from ερυθρος, red, and πελος, livid; becauſe of the colours it induces on the affected part.

ERYTHRINA, coral tree, in botany, a genus of plants whoſe flower conſiſts of a papilionaceous pentapetalous corolla; the fruit is a very long pod, protuberated by the ſeeds terminating in a ſmall point, and conſiſting of one cell, which is filled with kidney-ſhaped ſeeds.

This genus includes the corallodendrum of Tournefort, and the coral of Dillerius; but being ſomewhat tender, they require a hot-houſe in this country, particularly to produce their flowers, which grow in ſpikes, and are of a beautiful ſcarlet colour.

Theſe plants are beſt propagated by ſowing their ſeeds in the ſpring on a hot-bed, and afterwards tranſplanted ſingly into pots, and plunged into the bark-bed in the ſtove.

ERYTHROIDES, in anatomy, the firſt part of the proper tunics or coats which cover the teſticles. See TESTICLE.

ERYTHRONIUM, dog's-tooth violet, in botany, a genus of plants whoſe flower conſiſts of ſix oblong lanceolated reflexed petals, ſpreading open at their baſe with ſix filaments topped with oblong erect furrowed antheræ, the fruit is a ſubgloboſe capſule, with three cells, including a number of ovate acuminated ſeeds.

The root is recommended againſt the cholic, epilepſy, and worms; it is alſo reckoned a provocative to venery.

This genus comprehends the dens canis of Tournefort.

ERYTHROXYLON, in botany, a genus of plants, whoſe flower conſiſts of five ovate concave patent petals, with ten filaments topped with heart-ſhaped antheræ; the fruit is an egg-ſhaped unilocular drupe, containing an oblong quadrangular nut.

ESCALADE, or SCALADE, in the art of war. See the article SCALADE.

ESCAPE, in law, a violent or privy evaſion out of ſome lawful reſtraint, without being delivered by due courſe of law.

ESCAPE-WARRANT, a proceſs which iſſues out againſt a perſon committed in the King's-bench or Fleet-priſons, that, without being duly diſcharged, takes upon him to go at large.

Upon this warrant, which is obtained on oath, a perſon may be apprehended on a Sunday.

ESCHALOT, or SHALLOT, a ſpecies of the onion, much uſed in cookery. See ONION.

ESCHEAT, in law, ſignifies any lands or tenements that caſually fall to a lord within his manor, by way of forfeiture, or by the death of his tenant, without heirs general or ſpecial.

ESCHRAKITES, in matters of religion, a ſect of Mahometans, who believe that man's ſovereign good conſiſts in the contemplation of God. They avoid all manner of vice, and appear always in good humour, deſpiſing the ſenſual paradiſe of Mahomet. The moſt able preachers in the royal moſques are of this ſect.

ESCLATTE, in heraldry, ſignifies a thing forcibly broken, or rather a ſhield that has been broken and ſhattered with the ſtroke of a battle-ax.

ESCORT, in the art of war, the ſame with convoy. See the article CONVOY.

ESCULENT, an appellation given to ſuch plants or the roots of them, as may be eaten as food; ſuch are cabbages, onions, carrots, turnips, parſnips, potatoes, radiſhes, &c.

ESCULUS, or ŒSCULUS, the horſe-cheſnut, in botany. See the article HORSE-CHESNUT.

ESCUTCHEON, or SCUTCHEON, in heraldry, is derived from the French *eſcuſſon*, and that from the Latin *ſcutum*, and ſignifies the ſhield whereon coats of arms are repreſented.

Moſt nations, of the remoteſt antiquity, were wont to have their ſhields diſtinguiſhed by certain marks painted on them; and to have ſuch on their ſhields was a token of honour, none being permitted to have them till they had performed ſome honourable action.

The eſcutcheon, as uſed at preſent, is ſquare, only rounded off at the bottom.

As to the bearings on ſhields, they might at firſt be arbitrary, according to the fancy of the bearer, but, in proceſs of time, they came to be the gift of kings and generals, as the reward of honourable actions.

ESCUTCHEON *of Pretence*, that on which a man carries his wife's coat of arms, being an heireſs, and having iſſue by her. It is placed over the coat of the huſband, who thereby ſhows forth his pretenſions to her lands.

ESDRAS, the name of two apocryphal books, uſually bound up with the ſcriptures. They were always excluded the Jewiſh canon, and are too abſurd to be admitted as canonical by the papiſts themſelves. The firſt book is chiefly hiſtorical, giving an account of the return of the Jews from the Babyloniſh captivity, and the building of the ſecond temple; the ſecond is written in the prophetical way, pretending to viſions and revelations, but ſuch as are extremely ridiculous.

ESLIRASS, in law, perſons particularly appointed or choſen to impannel juries.

ESNECY, in law, a private prerogative allowed to the eldeſt coparcener, where an eſtate is deſcend-

ed to daughters for want of an heir male, to chooſe firſt, after the eſtate of inheritance is divided.

ESPALIERS, in gardening, are rows of trees planted in gardens, either to encloſe particular quarters of a garden, or the whole; the trees are moſt commonly fruit bearing, as apples, pears, or plumbs, theſe are trailed flat either to ſtakes or lattice work, and anſwers the purpoſes of breaking the winds from tender plants, hiding from the eye thoſe crops which appear unſightly, and producing handſome fruit; their diſtance to be planted may be ten or twelve feet, but this depends on the ſort and the richneſs of the ſoil: while the trees are young, it will be ſufficient to drive a few ſtakes into the ground, to which the branches ſhould be trained in an horizontal direction, as they are produced; afterward the eſpalier ſhould be made for good, and the trees regularly pruned, trained, and faſtened to it. Hardy fruit-trees, well managed by this method, are much preferable to thoſe trained up in any other figure, upon ſeveral accounts, as theſe take up but little room in a garden, ſo as to be hurtful to the plants which grow in the quarters; likewiſe, the fruit upon theſe are better taſted than thoſe which grow upon dwarfs, the ſun and air having freer acceſs to every part of the tree, whereby the damps ariſing from the ground is ſooner diſſipated, which is of ſingular advantage to fruit trees (as hath been ſhewn under the article BLIGHT). Alſo trees againſt an eſpalier, by being kept low and the branches faſtened, the fruit is not ſo liable to be blown off by the wind, therefore it muſt be allowed that eſpaliers are of conſiderable uſe as well as beauty.

ESPLANADE, in fortification, the ſloping of the parapet of the covert-way towards the campaign.

ESPOUSALS, in law, ſignify a contract or promiſe made between a man and a woman, to marry each other.

ESQUIRE, *Armiger*, was anciently the perſon that attended a knight in time of war, and carried his ſhield.

ESSAY, in coinage, See the article ASSAY.

ESSAY, in literature, a peculiar kind of compoſition, the character of which is to be free, eaſy, and natural; not tied to ſtrict order or method, nor worked up and finiſhed like a formal ſyſtem.

ESSAY-HATCH is the miner's term for a little trench or hole, which they dig to ſearch for ſhoad or ore.

ESSENCE is that which conſtitutes the peculiar nature of any thing, and makes it to be what it is.

In philoſophy, the eſſence of a thing is that which is the primary conception which one has of it, and is diſtinguiſhed from its act, which is called its exiſtence. Thus the eſſence of a rectilinear triangle conſiſts in its being bounded by three ſtraight lines; of a circle, in that its radii or ſemi-diameters are all equal; and the eſſence of a ſquare is, that it hath four right angles and four equal right-lined ſides.

ESSENCE, in chemiſtry, is the moſt pure, balſamic, and ſubtile parts, which have been extracted from any body by means of fire.

ESSENES, or ESSENIANS, in Jewiſh antiquity, one of the three ancient ſects among that people, who outdid the phariſees in their moſt rigorous obſervances. They allowed a future ſtate, but denied a reſurrection from the dead. Their way of life was very ſingular: they did not marry, but adopted the children of others, whom they bred up in the inſtitutions of their ſect: they deſpiſed riches, and had all things in common; and never changed their cloaths, till they were entirely worn out. When initiated, they were ſtrictly bound not to communicate the myſteries of their ſect to others; and if any of their members were found guilty of any enormous crimes, they were expelled.

Pliny tells us, that they dwelt on the weſt ſide of the lake of Aſphaltites; that they were a ſolitary kind of men, living without women or money, and feeding upon the fruit of the palm-tree: he adds, that they were continually recruited by new comers, whom the ſurges of ill fortune had made weary of the world; in which manner the ſect was kept up for ſeveral thouſands of years, without any being born among them. The reaſon why we find no mention made of them in the New Teſtament, may be their recluſe and retired way of life, no leſs than their great ſimplicity and honeſty, whereby they lay open to no cenſure or reproof.

ESSENTIA, ESSENCE, See the article ESSENCE.

ESSENTIAL, ſomething neceſſarily belonging to the eſſence or nature of a thing, from which it cannot be conceived diſtinct: thus the primary qualities of bodies, as extenſion, figure, number, &c. are eſſential or inſeparable from them in all their changes and alterations. See the article QUALITY.

ESSOIN, in law, an excuſe for a perſon ſummoned to appear and anſwer to an action on account of ſickneſs or other juſt cauſe of his abſence.

ESSOIN-DAY is regularly the firſt day of every term, though the fourth day after is alſo allowed by way of indulgence.

ESSORANT, in heraldry, denotes a bird ſtanding on the ground with its wings expanded, as if it had been wet, and were drying itſelf.

ESTABLISHMENT *of Dower*, in law, an aſſurance of dower made to the wife by the huſband, or ſome friend of his, on marriage.

ESTATE, in law, ſignifies the title or intereſt that a perſon has in lands, tenements, or other effects; comprehending the whole in which a perſon hath any property, and will paſs the ſame.

ESTATES, in a political ſenſe, is uſed either to denote

denote the dominions of some prince, or the general classes into which the people are divided.

ESTETE, in heraldry, denotes the heads of beasts torn off by main force.

ESTHER, a canonical book of the Old Testament, containing the history of a Jewish virgin, dwelling with her uncle Mordecai at Shushan, in the reign of Ahasuerus, one of the kings of Persia.

ESTOILEE, or CROSS-ESTOILEE, in heraldry, a star with only four long rays in form of a cross; and accordingly, broad in the center, and terminating in sharp points.

ESTOPPEL, in law, an impediment or bar to an action, which arises from a person's own fact; or rather, where he is forbid by law to speak against his deed, which he may not do, even to plead the truth.

ESTOVERS, in law, is most generally taken for certain allowances of wood made to tenants, as house-bote, hedge-bote, and plough-bote; which three are comprehended under reasonable estovers.

ESTRANGEL, ESTRANGELUS CHARACTER, in the Syriac grammar, a particular species or form of Syriac letters, serving as the majusculæ letters of that language, and by several supposed to be the true ancient Chaldee character.

ESTRAY, in law, any beast, not wild, that is found within a lordship, and owned by no body: in which case, being cried according to law in the two next market towns adjacent, and not claimed in a year and a day by the owner, it becomes the property of the lord of the manor or liberty wherein it was found.

ESTREAT, in law, a true copy, note, or duplicate of an original writing or record, especially fines, amercements, penalties, &c. set down and imposed in the rolls of a court, to be levied by the bailiff, or other officer.

ESTREPEMENT, in law, any spoil made by tenants for life on any lands, &c. to the prejudice of the reversioner: it is also taken to signify the making land barren, by continual ploughing and sowing, and thereby drawing out the heart of the ground without manuring, or rather good husbandry, by which means it is impaired.

It may likewise be applied to the cutting down of trees, or lopping them farther than the law allows.

ESURINE SALTS, such as are of a corroding, fretting, and eating nature; abounding chiefly in places near the sea-side, and where great quantities of coals are burnt, as appears from the speedy rusting of iron bars in the windows of houses built in such places.

ETAPPE, a term used in the French armies, for the provisions and forage allowed an army in their route through a kingdom, whether going into winter quarters, or returning to take the field. Hence, etapier is the undertaker or person who contracts with the country or territory for furnishing the said provisions.

ETCHING, a method of engraving on copper, in which the lines or strokes, instead of being cut with a tool, or graver, are eaten in with aqua-fortis.

ETERNITY, an attribute of God, expressing his infinite or endless duration. See the article GOD.

ETHICS, or MORALITY, the science of manners or duty, which it traces from man's nature and condition, and shews to terminate in his happiness; or, in other words, it is the knowledge of our duty and felicity, or the art of being virtuous and happy.

ETHIOPIC YEAR. See the article YEAR.

ETHMOIDAL, in anatomy, is applied to one of the common sutures of the skull, which goes round the os ethmoides, from which it derives its name, and which separates it from the bones in contact with it.

ETHMOIDES, is an epithet applied to a bone at the root of the nose, called also os ethmoides. See CRANIUM.

The word is Greek, ηθμοειδης, which is derived from ηθμος, a strainer, and ειδος, form or likeness.

ETHNOPHRONES, in church history, heretics of the seventh century, who, professing Christianity, joined thereto all the ceremonies and follies of paganism, such as judicial astrology, divinations of all kinds, &c. and who observed all the feasts, times, and seasons of the Gentiles.

ETHOPOEIA, or ETHOLOGY, in rhetoric, a draught, or description, expressing the manners, passions, genius, tempers, aims, &c. of any person.

ETYMOLOGY, that part of grammar which explains the derivation of words, in order to arrive at their first and primary signification.

The word is formed of the Greek, ετυμος, true, and λεγω, to say. Hence Cicero calls it *notatio* and *verilogium*. Quintilian calls it *originatio*.

EVACUANTS, in medicine, are properly such things as diminish the animal fluids by throwing out some morbid or redundant humour; or such as thin, attenuate, and promote the motion and circulation thereof.

The word is Latin, from *evacuo*, to empty or clean.

EVACUATION, in physic, the art of diminishing, emptying, or attenuating the humours of the body.

EVANGELISTS, at present, is confined to the writers of the four gospels, St. Matthew, St. Mark, St. Luke, and St. John. The apostle Paul, enumerating the several orders of Christians, according to the gifts bestowed on them, reckons evangelists in the third place, after apostles and prophets, and before pastors, and teachers.

The word is derived from the Greek ευαγγελος, which is derived from ευ, well, and αγγελος, an angel, or messenger.

EVANID, a name given by ſome authors to ſuch colours as are of no long duration, as thoſe in the rainbow, in clouds before and after ſunſet, &c.

Evanid colours are alſo called fantaſtical and emphatical colours.

EVANTES, in antiquity, the prieſteſſes of Bacchus; thus called, by reaſon that in celebrating the orgia, they ran about as if diſtracted, crying, *evan, evan, ohé evan.*

EVAPORATION, in philoſophy, is the act by which the moiſture in any body is exhaled or evaporated, either by the heat of the ſun, or by means of fire.

The word is Latin, *evaporatio*, and derived from *e*, out of, and *vapor*, a vapour.

EVAPORATION, in chemiſtry, is that operation whereby the more aqueous and volatile parts of fluids are evaporated or drove away in vapours, in order to render the remaining part of a higher conſiſtence than before.

EVASION, among lawyers, denotes a cunning or ſubtle endeavouring to ſet aſide, or eſcape the puniſhment of, the law.

EVATES, a branch or diviſion of the druids, or ancient Celtic philoſophers. Strabo divides the Britiſh and Gauliſh philoſophers into three ſects, bards, evates, and druids; but Marcellus and Hornius reduce them all to two ſects, viz. the bards and druids. See the articles BARDS and DRUIDS.

EUBAGES, an order of prieſts, or philoſophers, among the ancient Celtæ, or Gauls: ſome will have the eubages to be the ſame with the druids, and ſaronidæ of Diodorus; and others, that they were the ſame with what Strabo calls evates.

EUCHARIST, the ſacrament of the Lord's ſupper.

The word is Greek ευχαριστια, derived from ευ, well, and χαρις, favour or thanks.

In the beginning of Chriſtianity the whole church met together at the Lord's table, generally at their public aſſemblies, on Sundays always, beſides other days, eſpecially Saturday; on which day all the churches in the world, except Rome and Alexandria, uſed to celebrate their ſacrament. At firſt they adminiſtered the euchariſt every day; afterwards four times a week: but as the power of religion declined, it fell to thrice a year, as Chriſtmas, Eaſter, and Whitſuntide.

EUDISTS, a congregation of miſſionary prieſts, in France, aſſociated under the name and title of Jeſus and Mary.

EUDOXIANS, in church hiſtory, a branch of Arians. See ARIANS.

EVE, the ſame with vigil. See VIGIL.

EVECTION *of the Moon*, the ſame with libration. See the article LIBRATION.

EVERARD's *Sliding-Rule*. See SLIDING-RULE.

EVERGREENS, in gardening, a term given to thoſe plants which continue their verdure or foliage all the year; ſuch are pines, firs, cedars, hollies, bays, phillyreas, laurels, with many others.

EVERLASTING FLOWER, in botany. See the article XERANTHEMUM.

EVERLASTING PEA, in botany, a ſpecies of LATHYRUS, which ſee.

EVESDROPPERS, in law, perſons who ſtand under the eves, walls, or windows of a houſe by day or by night, to liſten after news, and carry it to others, thereby raiſing ſtrife and contention in the neighbourhood. They are puniſhable in the court-leet, or quarter-ſeſſions.

EUGENIA, in botany, a genus of plants, whoſe flower conſiſts of four oblong, obtuſe, concave petals, with a number of ſtamina inſerted in the cup. The fruit is a coronated quadrangular drupe, with one cell, containing a ſmooth roundiſh nut.

EVICTION, in law, ſignifies a recovery of lands, or tenements by law.

EVIDENCE. See CERTITUDE.

EVIDENCE, in law, is the teſtimony a perſon gives in court upon any fact of which he has a perſonal knowledge.

EVIL, *Malum*, in philoſophy, &c. is either moral or natural.

Moral evil is the diſagreement between the actions of a moral agent and the rule of thoſe actions, whatever it be.

Moral good and evil coincide with right and wrong, ſince that cannot be good which is wrong, nor that evil which is right.

Natural EVIL, whatever deſtroys, or any way diſturbs the perfection of natural beings: ſuch as blindneſs, diſeaſes, death, &c.

Kings EVIL, in medicine, the ſame with the ſcrophula. See the article SCROPHULA.

EUMENIDES, furies, in antiquity. See the article FURIES.

EUNOMIANS, in church hiſtory, Chriſtian heretics in the fourth century. They were a branch of Arians, and took their name from Eunomius, biſhop of Cyzicus, who was inſtructed by Ætius in the points which were then controverted in the church, after having at firſt followed the profeſſion of arms. Eunomius ſo well anſwered the deſigns of his maſter, and declaimed ſo vehemently againſt the divinity of the Word, that the people had recourſe to the authority of the prince, and had him baniſhed; but the Arians obtained his recal, and elected him biſhop of Cyzicus. The manners and doctrines of the Eunomians were the ſame with thoſe of the Arians.

EUNUCHS, in church hiſtory, a ſect of heretics in the third century, who were mad enough to caſtrate, not only thoſe of their own perſuaſion, but even all others that they could lay hold of: they took

took their rise from the example of Origen, who, misunderstanding the following words of our Saviour, — "And eunuchs who made themselves eunuchs for the kingdom of heaven," castrated himself.

EVOLUTE, Evoluta, in the higher geometry, a curve, first proposed by Mr. Huygens, and since much studied by the later mathematicians.

The evolute is a curve, supposed to be evolved or opened, and which, in opening describes other curves.

If a thread FCM (plate LIII. *fig.* 9.) be wrapped or wound about the curve BCF, and then unwound again, the point M will describe the curve AMM, which Mr. Huygens, the inventor, calls a curve described from evolution; and the curve BCF is the evolute, the part MC of the thread being called the radius of the evolute. 1. When the point B falls in A, the radius MC of the evolute is equal to the arch BC; but, if not, to AB + the arch BC. 2. The radius of the evolute CM is perpendicular to the curve AM. 3. Because the radius MC of the evolute continually touches it, it it evident, from the generation of the curve described from the evolution, that it may be described through innumerable points, if the tangents in the parts of the evolute are produced until they become equal to their corresponding arches. 4. The evolute of the common parabola is a parabola of the second kind, whose parameter is $\frac{2}{3}$ of the common parabola. 5. The evolute of a cycloid is another cycloid equal and similar thereto. 6. All the arches of evolute curves are rectifiable, if the radii of the evolute can be expressed geometrically.

EVOLUTION, in arithmetic and algebra, implies the extraction of the roots or powers. See Extraction.

The word is Latin, *evolutio*, formed of the preposition *e*, out; and *volvo*, I roll, or wind: q. d. an unwinding, or unrolling.

Evolution, in the art of war, the motion made by a body of troops, when they are obliged to change their form and disposition, in order to preserve a post, occupy another, to attack an enemy with more advantage, or to be in a condition of defending themselves the better.

Naval Evolutions, the divers movements performed by fleets or squadrons at sea, in ranging or forming into such lines or positions as may be thought most proper or expedient, either by engaging, defending, or retreating, to the greatest advantage. This term seems to have been first applied to the manœuvres of fleets by P. L'Hoste.

The different expeditions an admiral may be ordered upon, as well as the various circumstances that occur in conducting a fleet, first gave rise to the several lines or orders of which it is formed, whose motions form what is called evolutions. See the articles Line, Division, and Squadron.

Those who have any knowledge of the marine will undoubtedly allow, that the art of naval evolution is absolutely necessary; since this art consists only in the manner of regulating the several movements of a naval armament. Without this art it resembles that of the most barbarous nations who have not the least knowledge of war, who act without any other rule or order than what their wild ungoverned imaginations suggest to them, or chance throws in their way. Without a proper knowledge of the art of evolutions, an admiral will dispose of his fleet very imperfectly, whether in opposing the enemy, cutting them off, doubling upon, avoiding or chacing them to the greatest advantage; for all these things require that an admiral should move each part of his fleet, as the mind moves the different members of the human body.

EVOLVULUS, in botany, a genus of plants whose corolla is monopetalous, with five capillary stamina. The fruit is a subglobose capsule, having four cells, each containing a roundish seed.

EUONYMUS, the spindle-tree, in botany, a genus of plants whose flower consists of a monophyllous cup, with four or five ovated plane and patent petals; the stamina are five subulated erect filaments topped with twin antheræ. The fruit is a succulent, four or five cornered, coloured capsule, with the same number of cells and angles, each containing one oval seed.

A species of this genus grows naturally in England, in hedges and woods; it hath a strong woody stem, dividing into many branches which are furnished with spear-shaped leaves about three inches long, of a deep green colour, and placed opposite: it flowers the latter end of May and the beginning of June, and the fruit ripens in October.

The wood of this tree is used by the musical instrument makers for toothing of organs and virginal keys; the branches are cut for making skewers, and spindles are made of the wood, from whence came the English name, Spindle-tree; but in some counties it is called dog-wood: the other species are natives of foreign countries.

EUPATORIUM, hemp-agrimony, in botany, a genus of plants whose flowers are compound, uniform, and tubulose; the corolluæ are funnel-shaped and hermaphrodite, each having five short hairy filaments topped with cylindrical antheræ: on the calyx (which is oblong and imbricated) are placed the seeds, which are oblong, and crowned with a long hairy down.

The common eupatorium, which grows naturally in most parts of England, is of a purplish green colour, and full of white pith; the leaves grow thick upon the stalks and are like those of hemp, they have a very bitter taste, with a great degree of pungency, and are said to be hepatic, aperient, and vulnerary; also good against agues and obstructions of the viscera.

EUPHEMISM, εὐφημισμος, in rhetoric, a figure which expreſſes things in themſelves diſagreeable and ſhocking, in terms implying the contrary quality.

EUPHONY, εὐφωνια, in grammar, an eaſineſs, ſmoothneſs, and elegance in pronunciation.

Euphony is properly a figure, whereby we ſuppreſs a letter that is too harſh, and convert it into a ſmoother, contrary to the ordinary rules: of this there are abundance of examples in all languages.

EUPHORBIA, or EUPHORBIUM, in botany, a genus of plants whoſe flower conſiſts of four or five petals, which are thick, gibbous, turbinated, and truncated; the fruit is a roundiſh trilocular capſule, containing three roundiſh ſeeds.

There are many different ſpecies of the euphorbium, ſeveral of which are natives of Africa, and preſerved in Europe in the hot-houſes of the curious. Whether the officinal gummy reſin of that name is extracted from one particular ſpecies, or from ſeveral promiſcuouſly, is uncertain. It is commonly ſuppoſed to be the produce chiefly of that called by Breynius *Euphorbium cerei effigie*, &c. euphorbium reſembling the cereus or torch-thiſtle, with thicker ſtalks armed with long ſpines. What Ray calls the true euphorbium of the ancients is the ſpecies deſcribed in the *Hortus Malabaricus*, there named Schadidacalli, and by Breynius *Euphorbium Indicum*, &c. that is, Indian euphorbium, reſembling the opuntia or prickly pear, with a triangular jointed ſtalk.

The juice is extracted by wounding the ſtem in different parts, pieces of ſheep-ſkin being previouſly tied round near the bottom, to prevent its running down upon the ground: the inciſions are made with a long handled inſtrument, that the operator may receive no injury from the cauſtic liquor ſpurting upon the face, &c. The juice concretes into roundiſh, ſemi-tranſparent whitiſh tears, which for the moſt part are internally hollow: theſe are the euphorbium brought to us. We commonly find bits of the ſtalk, prickles, and ſeeds of the plant intermixed, and not unfrequently ſmall ſtones and ſand. The whitiſh or pale-yellowiſh tears are preferred, as being the freſheſt; the browner or darker coloured they appear, the longer they have been kept.

Euphorbium is in taſte extremely acrimonious: the ſlighteſt touch burns and corrodes the tongue: a ſmall quantity received into the noſe, occaſions violent ſneezing: the utmoſt caution is requiſite in pulverizing it, to guard the eyes, noſe, and mouth from the pernicious effects of the fine duſt that flies off.

The acrimony of euphorbium ſeems to reſide in the more ſubtile parts of the reſin, which are extracted wholly by ſpirit of wine, and almoſt wholly by water, the reſin and gum being nearly in equal proportions.

The extreme acrimony of this drug renders it abſolutely unfit for any internal uſe: ſeveral correctors have, indeed, been propoſed for abating its virulence, but the beſt of them are not to be truſted to. It is employed only, and that but ſeldom, for external purpoſes; in ſtimulating unguents and plaſters for paralytic limbs, carious bones, and beginning ſchirrous tumours. Some have ventured on a minute portion of it, mixed with other powders, as an errhine, in obſtructions of the noſtrils, and mucous diſorders of the head; a practice by no means adviſeable, as we are in no want of medicines for theſe purpoſes, equally effectual, and far more ſafe.

EUPHRASIA, eye-bright, in botany, a genus of plants, the corolla of which conſiſts of a ſingle ringent petal; the tube is of the length of the cup; the upper lip is concave and emarginated; the lower one is patent, and divided into three ſegments: the fruit is an ovato-oblong, compreſſed capſule, forming two cells: the ſeeds are numerous, very ſmall, and of a roundiſh figure.

This plant is celebrated for curing diſorders of the eyes; the leaves powdered and ſnuffed up the noſe, is ſaid to diſſolve thoſe thick groſs humours which ſometime happen in the brain.

EURYTHMY, in architecture, ſculpture, painting, &c. is a kind of majeſtic appearance, an inexpreſſible elegance and eaſineſs in the compoſition of all the members of a body, building, or picture, that reſults from their fine proportion and correſpondence with each other.

The word is Greek, εὐ, eaſily, and ῥυθμος, number, order.

EUSEBIANS, a name given to Arians. See the article ARIANS.

EUSTATHIANS, the ſame with the catholics of Antioch, in the fourth century, ſo called from their refuſing to acknowledge any other biſhop beſide St. Euſtathius, who was depoſed by the Arians.

EUSTYLE, in architecture, is a ſort of building in which the pillars are placed at the moſt convenient diſtance one from another, the intercolumniations being all juſt two diameters and a quarter of the column, except thoſe in the middle of the face, before and behind, which are three diameters diſtant.

The word is Greek, εὐστυλος, and derived from εὐ, proper, and στυλος, a column.

EUTYCHIANS, in church hiſtory, heretics in the fifth century, who embraced the errors of the monk Eutyches, maintaining that there was only one nature in Chriſt. The divine nature, according to them, had ſo entirely ſwallowed up the human, that the latter could not be diſtinguiſhed; inſomuch that Jeſus was merely God, and had nothing of humanity but the appearance. This hereſy was condemned in a council held at Conſtantinople in 448, which ſentence was confirmed by a general council of Chalcedon, in 451.

EWE, the Engliſh name of a female ſheep. See the article SHEEP.

EWRY, in the Britiſh cuſtoms, an office in the king's houſhold, which has the care of the table linen, of laying the cloth, and ſerving up water, in ſilver ewers, after dinner.

EXACERBATION, the ſame with paroxyſm. See the article PAROXYSM.

EXACTION, in law, a wrong done by an officer, or a perſon in pretended authority, in taking a reward or fee that is not allowed by law.

EXÆRESIS, in ſurgery, is the removing any thing hurtful or ſuperfluous out of the body.

The word is Greek, from ἐξ, out of, and αἱρεω, to take.

EXAGGERATION, in rhetoric, is a kind of hyperbole, whereby things are augmented or amplified, by ſaying more than the truth, either as to good or bad.

The word is Latin, *exaggeratio*, and derived from *ex* and *agger*, a bank.

EXALTATION, in aſtrology, is a dignity which a planet acquires in certain ſigns or parts of the zodiac, which dignity is ſuppoſed to give it an extraordinary efficacy and influence. Thus the 15° of Cancer is the exaltation of Jupiter, according to Abulmazar; that of the ſun is the 19° of Aries, and that of the moon is in Taurus.

EXAMINATION, in ſea affairs, a ſort of naval catechiſm, compoſed of various queſtions put by a committee of veteran ſea-captains to the midſhipmen, to diſcover whether they are ſufficiently qualified in the knowledge of their profeſſion to become a lieutenant.

EXAMINERS, in chancery, two officers of that court, who examine, upon oath, witneſſes produced in cauſes depending there, by either the complainant or defendant, where the witneſſes live in London, or near it. Sometimes parties themſelves, by particular order, are examined.

EXANTHEMA, in medicine, is a poſtule or eruption on the ſkin, as the meaſles, ſmall-pox, &c. and is generally attended with a fever, and terminates in a raſh.

The word is Greek, ἐξανθημα, which is derived from ἐξ, out of, and ἀνθεω, to flower.

EXARCH, ἐξαρχος, in antiquity, an officer ſent by the emperors of the Eaſt, into Italy, in quality of vicar, or rather præfect, to defend that part of Italy which ſtill continued under their obedience, and particularly the city of Ravenna, againſt the Lombaids.

EXCELLENCY, a title anciently given to kings and emperors, but now to ambaſſadors, and other perſons, who are not qualified for that of Highneſs, and yet are to be elevated above the other inferior dignities.

EXCENTRIC, or ECCENTRIC, in geometry, are circles that have not the ſame center.

The word is Latin, *excentricus*, and is derived from *ex*, out of, and *centrum*, a center.

The excentric circle in the Ptolemaic ſyſtem is alſo called deferent, becauſe it ſeems to carry the the planet round in its circumference. The orbit of the ſun is excentric with regard to the terreſtrial globe; that is, it does not revolve round the ſame center.

EXCENTRIC, in the new aſtronomy; inſtead of the excentric circles in the Ptolemaic ſyſtem, the moderns have ſuppoſed oval or elliptic ones, in order to explain the apparent irregularity of the planets, and their different diſtances with regard to the earth.

EXCENTRIC *Equation*, in the old aſtronomy, is an angle made by a line drawn from the center of the earth, and another drawn from the center of the excentric to the body or place of any planet; it is the ſame with the proſtaphæreſis, and is equal to the difference, accounted in an arch of the ecliptic, between the ſun's or planet's real and apparent place.

ECCENTRIC *Place of a Planet*, is the true point of the orbit upon which the circle of inclination coming from the place of a planet in its orbit, falls thereon at right-angles. Mars is very eccentric with regard to the ſun.

Anomaly of the ECCENTRIC. See the article ANOMALY.

EXCENTRICITY, or ECCENTRICITY, in the Ptolemaic aſtronomy, is that part of the linea apſidum lying between the center of the earth and of the excentric; or it is that circle which the ſun is ſuppoſed to move in about our earth, and which has not the earth exactly for its center. And this the ancients found muſt be ſuppoſed, becauſe the ſun ſometimes appeared large, and then it is neareſt to us; and ſometimes ſmaller, and then it is farther off.

EXCENTRICITY *of the Earth*, in the new aſtronomy, is the diſtance between the focus and the center of the earth's elliptic orbit.

Mr. Whiſton, in his *Prælect. Aſtron.* page 90, ſhews the method of finding this from the apparent motion of the ſun, compared with the two extremes of the apſides: for ſince the true velocity of the earth in her aphelion and perehelion is in a reciprocal ratio of her diſtances from the ſun; and that the apparent and angular velocity is in a duplicate ratio of her diſtances reciprocally; from the apparent difference of theſe two velocities, the difference of the diſtances, or the double exentricity, will eaſily be known. The excentricity of the whole diſtance is, at a mean, about a ſixtieth part, or more accurately .01786.

EXCEPTION, in law, denotes a ſtop or ſtay to an action, and is either dilatory or peremptory, in proceedings at common law; but in chancery it is

what

what the plaintiff alleges againſt the ſufficiency of an anſwer, &c.

EXCEPTION *to Evidence*, is where a demurrer is offered in any civil cauſe, for the inſufficiency of the evidence given, and the court does not agree to it; in ſuch caſe, the court, upon requeſt, is to ſeal a bill of exceptions to the evidence, which may be heard on a writ of error.

EXCEPTIONS *in Deeds and Writings*, is the ſaving a particular thing out of a general one granted by deed; as a room, ſhop, or cellar, out of a houſe; a field, or timber trees, out of land, &c.

EXCERPTA, in matters of literature. See EXTRACT.

EXCESS, in arithmetic and geometry, is the difference between any two unequal numbers or quantities, or that which is left after the leſſer is taken from or out of the greater. See SUBTRACTION.

EXCHANGE, in a general ſenſe, implies a contract or agreement whereby one thing is given or exchanged for another.

EXCHANGE, in commerce, is the trade of money carried on between one place and another, by means of bills of exchange.

The things neceſſary to be conſidered in exchange are; 1. The real monies of each country or trading town. 2. Their imaginary monies. 3. The par of exchange.

1. By real money is meant a certain quantity of metal coined by the authority of a ſtate, and current at a certain value, by virtue of that authority.

2. By imaginary money we are to underſtand all denominations uſed to expreſs ſuch ſums as have no real ſpecies, or coin, of the value of theſe denominations.

1. The real monies of England.

Gold coins.	£.	s.	d.
A guinea, valued at — —	1	1	0
A half guinea — —	0	10	6
A quarter guinea — —	0	5	3
Silver coins.			
A crown, valued at — —	0	5	0
A half crown — — —	0	2	6
A ſhilling — — —	0	1	0
A ſixpence — — —	0	0	6

Copper coins.

The half-penny, and the farthing, four of which make a penny.

Imaginary monies.

The pound, equal to twenty ſhillings.
The mark, equal to thirteen ſhillings and four pence.
The angel, equal to ten ſhillings.
The noble, equal to ſix ſhillings and eight pence.
The penny, equal to four farthing.

2. The real monies of Holland.

Gold coins.	Florins
A ducat, or ducatoon, valued at ——	20
A ſovereign — — —	15
A roſe noble — — —	11
Silver and copper coins.	**Stivers**
A ducatoon, valued at — —	63
A dric gulden — —	60
A rix-dollar — — —	50
A crown — — —	40
A dollar — — —	30
A guld florin — — —	28
A ſchilling or ſhilling — —	06
A ſtiver — — —	01

Imaginary monies.

The guilder, or florin, of twenty ſtivers, or 240 groots.

The pound Flemiſh, of twenty ſhillings, or ſix guilders.

The groot, or penny Flemiſh, of half a ſtiver, or eight pfennicks.

The pfennick, or pfenning, or denier, $\frac{1}{16}$ of a ſtiver.

At Amſterdam, Rotterdam, Middleburg, &c. they keep their accounts either in guilders, ſtivers, and pfennicks; or pounds, ſhillings, and pence Flemiſh; which are divided as ours, viz. their pound into twenty ſhillings, and their ſhillings into twelve pence.

They exchange with London upon the pound ſterling, giving for it, when at par, 10 guilders, or, which is the ſame thing, thirty-three ſhillings and four pence Flemiſh.

The courſe of exchange runs between thirty and thirty-eight ſhillings Flemiſh per pound ſterling.

In Hamburgh and Antwerp, they keep their accounts and exchange with London, in the ſame manner as with Holland.

London exchanges alſo with Denmark, Norway, Sweden, Muſcovy, Germany, Switzerland, Savoy, &c. but it is commonly done by the way of Hamburgh, Amſterdam, or Antwerp.

3. The real monies of France.

Gold coins.	Livres
Double louis d'or — — —	22
Louis d'or — — —	11
Half louis d'or — — —	05½
Silver coins.	
Ecu or crown — — —	3
Half ecu — — —	1½

They have alſo a $\frac{1}{5}$ ecu and $\frac{1}{10}$ ecu

Braſs

Braſs coin.

The only braſs coin is the ſol, twenty of which make a livre.

Copper coins.

The liard or farthing, four of which make a ſol.

The denier, twelve of which make a ſol.

The double, which was coined for a double denier, but paſſes now for a liard.

Imaginary monies.

The piſtole, equal to ten livres.

The livre, equal to twenty ſols, or $\frac{1}{3}$ of an ecu.

At Paris, Lyons, Rouen, &c. they keep their accounts in livres, ſols, and deniers: and exchange upon the ecu, or crown; the par of which, in ſterling money, is four ſhillings and ſixpence.

But it is to be obſerved, that the kings of France often raiſe the ſpecies of the kingdom to rates conſiderably higher than thoſe for which they were at firſt coined, and conſequently far above their intrinſic value: ſo that a crown in ſpecie will paſs at four, five, or ſix livres. And three ſuch livres are ſtill named an ecu, or crown, though of a far leſs value than the ecu blanc, or white crown, that is, a crown in ſpecie. Hence it happens that the exchange is very variable, and falls low in proportion to the riſing of the French money above the intrinſic worth of the ſpecies.

The courſe runs between twenty-five and forty pence ſterling per crown, or between twenty and thirty livres per pound ſterling.

N. B. The French add the term tournois to their money, to diſtinguiſh it from the money of other nations, in the ſame manner as the Engliſh add the word ſterling to theirs.

The money of Spain is of two ſorts, viz. of plate and of bullion; the plate-money is of good ſilver, never changes its price, and is reckoned more than twenty per cent better than the money of bullion, which is a mixture of ſilver and braſs, and as often varying in its price. In many places they buy and ſell in rials of bullion, but when they ſtate the accounts in their books, they commonly reduce them, by an allowance of ſo much per cent. to rials of plate.

4. The real and imaginary monies of Spain.

	Gold coins.	Mervadies
A piſtole, valued at four peſos, or pieces of eight, or at	— —	1088
An half piſtole, at two peſos, or	—	544
Silver coins.		
A peſo, or piece of eight, $\frac{8}{8}$ at	— —	272
A rial, at	— — —	34

A mervadie is a ſmall piece of braſs or copper, five of which and about $\frac{1}{2}$, are, in value, equal to an Engliſh penny.

The imaginary ducat, in exchange, is valued at 375 mervadies, but in buying and ſelling it is only accounted 374.

In Madrid, Seville, &c. they keep their accounts in rials and mervadies, and exchange upon the piece of eight, the par of which, with London, is four ſhillings and ſixpence; but the courſe of exchange runs between fifty-two pence and ſeventy-two pence ſterling.

5. The real monies of Portugal.

	Rees.
Broad ducat of gold, valued at —	1000
Double piſtole — — —	4000
Piſtole — — —	2000
Half-piſtole, or mil-ree — —	1000
Stamped patacoon — —	600
Current patacoon — —	500
Stamped cruſade — — —	500
Current cruſade — — —	400
Stamped piſo — — —	480
Teſton — — —	100

There are alſo the fractions of a teſton, at 80, 60, 40, 20, and 10 rees, which are of a mixed metal, compoſed of ſilver and braſs.

There are ſeveral other ſpecies in Portugal; ſuch as the moidore, a gold coin, valued at twenty-ſeven ſhillings ſterling; the John, or Joannes, which is alſo gold, worth thirty-ſix ſhillings; the half Joannes and quarter Joannes; as alſo the double Joannes, valued at three pound twelve ſterling, &c.

In Liſbon, Oporto, &c. they keep their accounts in rees, and exchange in the half piſtole, or mil-ree; the par of which is about ſix ſhillings and eight-pence half-penny ſterling; but the courſe of exchange runs commonly betwixt fifty and eighty-pence ſterling per mil-ree.

6. The ſpecies or coins of Italy are very numerous, and would require more room than can be ſpared in this place: paſſing, therefore, the real monies, we ſhall only ſhew the manner of exchange between London and Genoa, Leghorn, Milan, Venice, and Rome.

At Genoa, they keep their accounts in lires, ſoldi, and deniers; reckoning twelve deniers to a ſoldi, and twenty ſoldi to a lire; and exchange upon the peyzo, of five lires, whoſe par is about four ſhillings and ſix-pence ſterling: and the courſe of exchange is from forty-ſix to ſeventy-ſix and ſeventy-eight pence per peyzo.

At Milan they keep their accounts in the ſame manner, but exchange upon the ducat, of five lires fifteen ſoldi. The courſe of exchange runs from fifty-five to ſixty-ſeven pence ſterling per ducat.

At Venice, merchants keep their accounts in lires, ſoldi, and pichioli; reckoning twelve pichioli to the ſoldi, and twenty ſoldi to the lire. But the bank reckons by ducats and groſſes. The ducat conſiſts of twenty-four groſſes. They exchange upon the ducat; the par of which is four ſhillings and eight-pence halfpenny ſterling, and the courſe

is from fifty-two to fixty-nine pence ſterling per ducat bancho.

Rome exchanges with London upon the ſcudi, whoſe par is about five ſhillings and ſixpence ſterling per ſcudi.

7. In the plantations of America, they reckon their monies, and keep their accounts, the ſame way as they do in Britain. But their money is of far leſs value; for bills upon London from any of the Caribbee-Iſlands are uſually charged with 25 per cent. in favour of London; that is, if St. Chriſtopher's, Montſerrat, Antigua, &c. ſhould draw upon London 100*l.* the merchants of London charge the drawer with 125*l.* for the ſaid 100; and for Jamaica, Virginia, Maryland, Penſilvania, New-England, &c. the difference is commonly greater.

London exchanges alſo with Ireland; but the courſe of exchange varies according to the demand of money or bills; it is commonly between four and fifteen per cent. loſs to Ireland, or in favour of London.

The end and deſign of exchange is to avoid the riſk, and ſave the expence, of transferring money.

The conſequence is, that bills of exchange repreſent money ſo effectually, that there is no difference between the one and the other. An example will ſet theſe propoſitions in a clearer light.

Let us ſuppoſe Peter of London debtor to Paul of Paris for goods received, and, at the ſame time, that Anthony of Paris has bought of James of London goods of an equal value: if the two creditors (Paul of Paris and James of London) exchange their debtors, a transfer of money is needleſs. Let Peter of London pay to James of London the ſum he owes to Paul of Paris, and let James for the ſaid ſum transfer to him, by an order in writing, that which he has at Paris in the hands of Anthony. Peter, the proprietor of this order, will transfer it to Paul his creditor at Paris, and Paul, on preſenting it to Anthony, will receive caſh for it.

If no merchant of Paris had owed money in London, Peter would have been under the neceſſity of ſending over money to Paris to pay his debt: or, if James had ſold, at Paris, only to half the value that Peter was indebted there, the half of Peter's debt would have been acquitted, the other half by ſending over the ſpecie.

It is evident, therefore, that exchange ſuppoſes reciprocal debts, that without them it could not exiſt, and that it conſiſts in the exchange of the debtors.

The example propoſed proves alſo, that the object, end, and deſign of exchange, is to ſpare the hazard and expence of transferring money. Let us ſuppoſe the debt between the two, 100*l.* and value the riſk and charges on merchandize in trade at 40*l.* it is plain each muſt pay 110*l.* inſtead of 100*l.* without an exchange of debtors.

The conſequence is alſo completely demonſtrated by this example, for the bill of exchange drawn by James of London, or Anthony of Paris, was ſo effectually the ſign of money, that Paul of Paris, to whom it was ſent, has actually received 100*l.* on preſenting it.

For underſtanding the par of exchange, it muſt be obſerved, that it has been found convenient, in the fabrication of monies, to mix a certain quantity of baſer metal, called alloy, with the pure gold and ſilver; and the proportion of alloy is different in different kingdoms: and accordingly, the coins are ſaid to be of a different degree of fineneſs; and two coins, though of a different weight, that have an equal quantity of pure gold or ſilver, are ſaid to be at par. And upon a computation it has been found, that the quantity of pure ſilver in an Engliſh crown is as 9 to 10; and therefore the par of the French crown is, in ſterling-money, four ſhillings and ſixpence. In like manner are other coins to be compared, in order to have their par determined.

The cauſes of the alteration of the par of exchange, are the alteration of public credit, and the abundance or ſcarcity of credits of one country upon another.

A variation in the current coin is an example of the variation which the loſs of public credit makes in the par of exchange: although, at the very inſtant this change was made in the current coin, a new real par of exchange commenced, yet, the public credit declining, on account of the uncertainty of the property and the ſpecie not circulating, what repreſents the ſpecie muſt of courſe be under its value.

The ſecond cauſe of the alteration of the par of exchange, is the abundance or ſcarcity of credits of one country upon another; and this abundance or ſcarcity proceed in general from two cauſes.

One is the neceſſity that obliges the body politic of a ſtate to tranſport large ſums into foreign countries, as in caſe of a war.

The other lies in the proportion of the current mutual debts of private perſons in each ſtate.

The private perſons of two nations may contract two kinds of reciprocal debts.

The inequality of reciprocal ſales will form a firſt kind of debts.

If one of the two nations has a great deal of money at lower intereſt than the other, the rich private perſons in the former nation will buy up all the public ſecurities of the other, becauſe they will receive more intereſt for their money: the product of this intereſt, which muſt be paid every year, forms a ſecond ſpecies of debts: this may be looked upon as the product of a commerce, becauſe the national funds are negociated; and, if you obſerve attentively, this is not a matter of ſpeculation only; in this caſe and ſeveral others, money is the merchandiſe, and

and thus these two debts belong properly to what is called the balance of trade, and will occasion an abundance or scarcity of the credits of one country upon another.

When two nations would settle the balance of their commerce, that is, pay their reciprocal debts, they have recourse to the exchange of debtors; but if the reciprocal debts are not equal, the exchange of debtors will only pay a part of these debts, the surplusage or balance of trade must be paid in specie.

The design and intention of exchange is to save the expence and hazard of transporting money; consequently, every private person, before he determines on this method of trade, will seek credits on the country where he stands indebted.

These credits will be dear in proportion to the difficulty of acquiring them, and consequently, to have the preference, we are obliged to pay above their real value; if the credits are easy to come at, we shall pay under their value.

Let us suppose the merchants of Paris owe the manufacturers of Rouen 20,000 livres, and that the manufacturers of Rouen owe the bankers of Paris 10,000 livres; to satisfy these demands, we must make a bill of exchange for the 10,000 livers, the reciprocal debts between Paris and Rouen, and send the other 10,000 livers from Paris to Rouen.

Let us rate the charge and hazard of sending this sum at five livers per m. Every merchant in Paris will try to save this expence, and will seek to purchase a credit of 1000 livers on Rouen; but as these credits are scarce, and difficult to procure, he will gladly give 1004 livers for a draught of 1000 livers on Rouen, and save one liver per m. Thus the scarcity of bills of exchange on Rouen will lower the price of this exchange four livers per m. under par.

EXCHANGE also signifies a place in most considerable trading cities, wherein the merchants, negociants, agents, bankers, brokers, interpreters, and other persons concerned in commerce, meet on certain days, and at certain times, in order to confer and treat together of matters relating to exchanges, assurances, freightments, and other mercantile negociations both by sea and land.

These assemblies are held with so much exactness, that the absence of a merchant, &c. makes him suspected of drawing to a failure or bankruptcy, as not being able to stand the change.

EXCHANGERS are such as return money by bills of exchanger.

EXCHEQUER, in the British jurisprudence, an ancient court of record, in which all causes concerning the revenues and rights of the crown are heard and determined, and where the crown revenues are received.

It took this name from the cloth that covered the table of the court, which was party-coloured, or chequered.

Black Book of the EXCHEQUER, a book containing a description of the court of England in 1175, and its officers, with their ranks, wages, privileges, perquisites, &c. also the revenues of the crown, both in money and cattle.

EXCISE, a certain duty or impost, charged upon liquors, as beer, ale, cyder, perry, malt, &c. and several other commodities, within the kingdom of Great-Britain, and town of Berwick upon Tweed.

The excise is one of the most considerable branches of the king's revenues. It was formerly farmed out, but is now managed for the king by commissioners in both kingdoms, who receive the whole product of the excise, and pay it into the exchequer. These commissioners are nine in number in England, and four in Scotland. The former have a salary of 1000 *l.* a year, the latter 500 *l.* They are obliged by oath to take no fee or reward, but from the king himself; and from them there lies an appeal to five other commissioners, called commissioners of appeals.

EXCLAMATION, in rhetoric, is an elevation of the voice which expresses the vehemence of any passion, as surprize, joy, admiration, indignation, grief, fear, desire, &c. In English the interjections O! oh! alas! &c. are generally used in exclamation, in Latin oh! heu! ah! vah! &c.

The word is Latin, and derived from *exclamo*, to cry out.

EXCOMMUNICATION, an ecclesiastical penalty or censure, whereby such persons as are guilty of any notorious crime or offence are separated from the communion of the church, and deprived of all spiritual advantages.

EXCOMMUNICATO CAPIENDO, a writ issued from the chancery upon the bishop's certifying an excommunication.

EXCORIATION, in medicine and surgery, the galling or rubbing off of the cuticle, especially of the parts between the thighs and about the anus.

EXCORTICATION, the same with barking of trees. See the article BARKING.

EXCREMENT, whatever is discharged out of the body of animals, after digestion, or whatever is otherwise superfluous or noxious in them. Urine and the fæces are the gross excrements that are discharged out of the bladder or belly. Physicians likewise call excrement the various humours that are secreted from the blood through the various strainers in the body, and which serve for several uses, such as the saliva, sweat, bile, the pancreatic juice, lymph, the semen, nails, the hair, the horns and hoofs of animals.

The word is Latin, *excrementum*, which is derived from *excreo*, to spit or spawl.

EXCRESCENCE, in surgery, is any superfluous matter that grows preternaturally upon the human

human or any other body; as wens, warts, or any ſort of ſwelling, particularly a fleſhy tumour.

The word is Latin, *excreſcentia*, which is derived from *excreſco*, to ſhoot or grow out.

EXCRETION, in medicine, is the act of ſeparating excrements, or excrementitious humours, from the aliments or blood.

The word is Latin, *excretio*, which is derived from *ex*, out of, and *creo*, to chooſe.

EXCRETORY, in anatomy, is a term applied to certain little ducts or veſſels which make part of the ſtructure of the glands, being the ſmall tubes through which the humours, ſeparated into the glands, are diſcharged out of them into ſome convenient receptacle or emunctory.

EXCURSION, in aſtronomy, is uſed in a ſynonimous ſenſe with elongation. See the article ELONGATION.

EXECRATION, *execratio*, in antiquity, a kind of puniſhment, conſiſting of direful curſes and marks of infamy.

EXECUTION, in a general ſenſe, the act of accompliſhing, finiſhing, or atchieving any thing that is to be done.

EXECUTION, in law, the completing or finiſhing ſome act, as of judgment, deed, &c. and it uſually ſignifies the obtaining poſſeſſion of any thing recovered by judgment of law.

Military EXECUTION, the pillaging or plundering of a country by the enemy's army.

EXECUTOR, in law, a perſon appointed by another's laſt will and teſtament to have the execution of the ſame after his deceaſe, and the diſpoſing of the teſtator's goods and effects according to the intent of the will.

The law accounts an executor one perſon with the party whoſe executor he is; having all the advantages of action, and being ſubject to the ſame actions as the deceaſed.

Hence, as an executor derives his power wholly from the will, he may releaſe a debt, or do any thing as executor, before probate of the will, provided he afterwards proves it: however, to maintain actions for debts, he muſt ſhew the teſtament proved. He may immediately take the goods, or give power to another to ſeize them for him.

A perſon capable of making an executor, either makes one, two, three, or more; and he may appoint that one ſhall be his executor for one year, and another for another. If he appoints executors only for a certain number of years, after they are elapſed, the ordinary may grant adminiſtration of the goods; as he may do, till the power of the executors take place. It is alſo obſervable, that where there is no executor, there is properly no will: and where there is no will there can be no executors; but this only regards goods; for where lands in fee are deviſed, it is a good will, though no executor be named therein.

An executor may either accept or refuſe the executorſhip; but after he has accepted the office, he ſhall not refuſe the ſame, nor take it up after refuſal. If any one of the ſeveral executors prove the will, it will ſerve for all; ſo that the reſt may at any time after join with him and intermeddle with the eſtate. When any action is brought, it muſt be in the name of all the executors, notwithſtanding ſome of them may not act; but in any action commenced againſt them, he only that adminiſters is to be ſued. The poſſeſſion of one executor is held to be poſſeſſion of them all; and moſt acts done by or to one, are deemed done by or to all of them.

EXECUTORY, in law, is where an eſtate in fee, that is made by deed or fine, is to be executed afterwards by entry, livery, or writ. Leaſes for years, annuities, conditions, &c. are termed inheritances executory.

EXECUTORY DEVISE, is when the fee by deviſe is veſted in any perſon, and is to be veſted in another upon contingency. In all caſes of executory deviſes, the eſtates deſcend until the contingencies happen.

EXEDRA, in church hiſtory, a name ſometimes given to the ambo. See AMBO.

EXEDRÆ, in antiquity, a general name for ſuch buildings as were diſtinct from the main body of the churches, and yet within the limits of the church taken in its largeſt ſenſe.

EXEMPLIFICATION OF LETTERS PATENT, a tranſcript or duplicate of them, made from the inrollment thereof, and ſealed with the great ſeal.

EXEMPTION, in law, a privilege to be free from ſome ſervice or appearance.

EXERCISE, is ſuch an agitation of the body as produces ſalutary effects in the animal œconomy.

Exerciſe, Dr. Cheyne obſerves, is indiſpenſably neceſſary to preſerve the body in due plight; without exerciſe the juices will thicken, the nerves relax, the joints ſtiffen; and, on theſe diſorders, chronical diſeaſes and a crazy old age will enſue. The body may be conſidered as a ſyſtem of tubes and glands admirably adapted throughout, as a proper engine for the ſoul to work with. Exerciſe ferments the humours, caſts them into their proper channel, throws off redundancies, and helps nature in thoſe ſecret diſtributions without which the body cannot ſubſiſt in its vigour, nor the ſoul act with chearfulneſs. Had not exerciſe been abſolutely neceſſary for our well-being, nature would not have given ſuch an activity to the limbs of the body, and ſuch a pliancy to every part, as neceſſarily produce thoſe compreſſions, extenſions, dilatations, and all other kinds of motions neceſſary for the preſervation of ſuch a ſyſtem of tubes and glands. And, that we might not want inducements to ſuch an exerciſe of the body, riches and honour, even food and raiment,

ment, are not to be come at, without the toil of the hands, and ſweat of the brow.

He farther obſerves, that thoſe organs of the body which are moſt uſed, always become the ſtrongeſt. Thus the legs, feet, and thighs of chairmen, the arms and hands of watermen, the backs and ſhoulders of porters, grow thick and ſtrong by uſe. Of all the kinds of exerciſe there is none which conduces ſo much to the health, and is every way accommodated to the body, as that of riding, which is leſs laborious and expenſive of ſpirits than any other. Dr. Sydenham is very laviſh in its praiſes. Dr. Mead too recommends it in the concluſion of his *Monita & Præcepta*.

EXERCISE, in military affairs, is the ranging a body of ſoldiers in form of battle, and making them perform the ſeveral motions and military evolutions with different management of their arms, in order to make them expert therein.

EXERCISES are alſo underſtood of what young gentlemen learn in the academies and riding ſchools, ſuch as fencing, dancing, riding the great horſe, &c.

EXERGUM, among antiquarians, a little ſpace around or without the figures of a medal, left for the inſcription, cypher, device, date, &c.

EXFOLIATION, in ſurgery, the ſcaling of a bone, or its ſeparating into laminæ or leaves.

The word is Latin, *exfoliatio*, and derived from *ex*, and *folium*, a leaf.

EX GRAVI QUERELA, in law, is a writ that lies for the perſon to whom any lands or tenements in fee are deviſed by will, and the heir of the deviſor enters thereon, and detains them from the deviſee.

EXHALATION, in philoſophy, is applied to thoſe dry corpuſcles, as alſo to the pinguious, oleaginous, ſulphureous particles or effluvia, that are ſeparated from hard, earthly, fat bodies, particularly the earth itſelf, either by the heat of the ſun, the agitation of the air, or ſome other cauſes; and being emitted upwards, to a certain height in the atmoſphere, there mix with the vapours, which properly are thoſe moiſt fumes that are raiſed from water, and other liquid bodies. and help to form clouds, which return back in dew, miſt, rain, ſnow, hail, &c.

The word is Latin, *exhalatio*, which is derived from *exhalo*, to breath, or ſteam out.

The nitrous and ſulphureous exhalations are the chief matter of which thunder, lightning, dew, and other meteors are generated in the air. According to Sir Iſaac Newton, true and permanent air is formed from the exhalations raiſed from the hardeſt and moſt compact bodies.

EXHAUSTED RECEIVER, a glaſs, or other veſſel, out of which the air hath been drawn by means of the air-pump. See the article AIR-PUMP.

EXHAUSTIONS, in mathematics, is a method in frequent uſe among the ancient mathematicians, Euclid, Archimedes, &c. that proves the equality of two magnitudes, by a deduction ad abſurdum, in ſuppoſing that, if one be greater or leſs than the other, there would follow an abſurdity: this is founded on what Exclid ſays in his tenth book, namely, "That thoſe qualities whoſe difference is leſs than any aſſignable one, are equal;" for if they were unequal, be the difference never ſo ſmall, yet it may be ſo multiplied, as to become greater than either of them; if not ſo, then it is really nothing. This he aſſumes in the proof of the firſt propoſition of book ten, which is, "That if from the greater of two quantities you take more than its half, and from the remainder more than its half, and ſo continually, there will at length remain a quantity leſs than either of thoſe propoſed.

On this foundation they demonſtrate, that if a regular polygon of infinite ſides be inſcribed in, or circumſcribed about a circle, the ſpace that is the difference between the circle and the polygon will, by degrees, be quite exhauſted, and the circle be equal to the polygon.

EXHIBIT, in law, is where a deed, or other writing, being produced in a chancery ſuit, to be proved by witneſſes, the examiner, or commiſſioner appointed after the examination of any ſuch, certifies on the back of the deed, or writing, that the ſame was ſhewn to the witneſs, at the time of his examination, and by him ſworn to.

EXHIBITION, a benefaction ſettled for the benefit of ſcholars in the univerſities, that are not on the foundation.

EXHIBITION was anciently an allowance for meat and drink, ſuch as the religious appropriators made to the poor depending vicar.

EXHORTATION, in rhetoric, differs only from ſuaſion, as being more directly addreſſed to the paſſions.

EXIGENT, in law, a writ which lies where the defendant in a perſonal action cannot be found, nor any effects of his within the county, by which he may be attached or diſtrained.

EXIGENTERS, four officers in the court of Common-Pleas, who make all exigents and proclamations in all actions where proceſs of outlawry lies.

EXILIUM, in law, ſignifies a ſpoiling; but ſeems to be reſtrained to the injury done to tenants by altering their tenure, ejecting them, &c.

EXISTENCE, that whereby a thing has an actual eſſence, or is ſaid to exiſt, or be.

The word is Latin, and derived from *exiſto*, to be, or exiſt.

It has been a ſubject of great diſpute, whether eternal bodies have any exiſtence but in the mind; that is, whether they really exiſt, or exiſt in idea only.

only. The former opinion is supported by Mr. Locke, and the latter by Dr. Berkeley.

Those who desire to see the arguments brought by those learned authors, we refer to Locke's Essay on Human Understanding, and Berkeley's Princip. of Human Knowledge.

EXIT, *Exitus*, in law, properly signifies issue, or offspring; but is also applied to issues, annual rents, and profits of lands.

EXIT, in a theatrical sense, the action of a player in going off the stage, after he has played his part.

EXODIUM, in the ancient Greek drama, one of the four parts or divisions of tragedy, being so much of the piece as included the catastrophe and unravelling of the plot, and answering nearly to our fourth and fifth acts. See EPILOGUE.

EXODIUM, εξοδιον, in the Septuagint, signifies the end or conclusion of a feast.

EXODUS, a canonical book in the Old Testament, being the second of the Pentateuch, or five books of Moses.

It is so called from the Greek εξοδος, going out, or departure of the children of Israel from the land of Egypt; the history of which is delivered in this book, together with the many miracles wrought on that occasion.

EX OFFICIO, among lawyers, signifies the power a person has, by virtue of his office, to do certain acts without being applied to.

EXOMPHALUS, in surgery, is a hernia, or kind of rupture, that exhibits a preternatural tumor or protuberance at the navel.

The word is Greek, εξομφαλος, and derived from εξ and ομφαλος, the navel.

This rupture is owing to the protrusion of the intestine, or omentum, or both of them, at the navel, and rarely happens to be the subject of an operation; for though the case is common, yet most of them are gradually formed from very small beginnings, and if they do not return into the abdomen upon lying down, in all probability they adhere without any great inconvenience to the patient, until some time or other an inflammation falls upon the intestines, which soon brings on a mortification and death; unless, by great chance, the mortified part separates from the sound one, leaving its extremity to perform the office of an anus: in this emergency, however, I think it adviseable to attempt the reduction, if called in at the beginning, though the universal adhesion of the sac and its contents are a great obstacle to the success: the instance in which it is most likely to answer, is when the rupture is owing to any strain, or sudden jerk, and is attended with those disorders which follow upon the strangulation of a gut.

In this case, having tried all other means in vain, the operation is absolutely necessary: which may be thus performed: make the incision somewhat above the tumour, on the left side of the navel, through the membrana adiposa; and then emptying the sac of it water, or mortified omentum, dilate the ring with the same crooked knife, conducted on your finger; after this, return the intestines and omentum into the abdomen, and dress the wound without making any ligature, but of the skin only. *Sharp's Surgery.*

EXORCISM, a ceremony consisting of prayers and conjurations to drive the devil out of persons possessed, or for the removal of any danger or diseases from man or beast, and to destroy vermin and noxious animals.

The word is Greek, εξορκισμος, and derived from εξ, out of, and ορκος, an oath, or religious ceremony.

The use of exorcism is almost as ancient as the church: it makes a considerable part of the superstition of the Romish church, for which she hath appointed many ridiculous ceremonies in her rituals. The Romanists not only exorcise demoniacs, but likewise houses and other places which are haunted, as it is called; and this is done in the same manner as the exorcism of persons.

The ancient heathens practised exorcisms, but they were performed by the old women only, who, gadding from house to house, used to sprinkle them with lustral water, and lay the spirits by certain forms, some very whimsical and ridiculous ceremonies. The modern heathens of the East and West Indies have also several ceremonies among them for casting out devils and hobgoblins.

EXORDIUM, in rhetoric, is the introduction, preamble, or beginning of any discourse, serving to prepare the audience for what is to follow.

The word is Latin, and derived from *ex*, out of, and *ordior*, to begin.

It is a fault into which the ancients have very often fallen, to make an exordium that has no relation to the subject in hand: in this the Greeks took more liberty than the Latins. The exordium should be laboured with great care, whence Tully calls it *difficillima pars orationis*. It should be simple, and free from too bold metaphors: the stile should not be too much raised, nor should it run into bombast. It was forbidden to make exordiums in the Areopagus at Athens, as it is an indirect and imperceptible manner of prepossessing the audience. There are two kinds of exordiums, the one just and formal, the other vehement and abrupt. In the first, the audience is prepared and conducted by due and easy steps; in the second, the orator breaks out upon his audience at once, as if seized with some sudden passion. Such is that exordium of Isaiah, "Hear, O Heavens; and give ear, O Earth!" Abrupt exordiums are the most proper on occasions of extraordinary joy, indignation, &c.

EXOSTOSIS is a preternatural excrescence of a bone,

bone, as often happens in venereal cases: or rather a protuberance caused by a bone's being out of its natural position.

The word is Greek, ἐξοστωσις, and derived from ἐξ, off, or out of, and ὀστεον, a bone.

EXOTIC, is a term chiefly applied to plants which are foreign, and not of our own growth, particularly those brought from the East and West Indies: whence the use of hot-beds, green-houses, &c. in order to make them thrive.

The word is Greek, ἐξωτικος, and derived from ἐξω, from without, or abroad.

Dr. Lister, in the Philosophical Transactions, gives an account of exotic diseases, as, 1. The plague, which is properly a disease of Asia, where it is epidemic. 2. The small-pox, not known in Europe, or even Asia-Minor, or Africa, till a spice trade was opened to the remotest parts of the Indies, where it rages more cruelly than among us. 3. The griping of the guts, which he takes to be peculiar to the West-Indies, and yearly received from thence; which he says is quite different from the tormina ventris of the ancients, and is scarce ever known in the midland countries, or far in the north of England.

EXPANSION is the opening and stretching out of any body; but generally it signifies such an alteration as is made by rarefaction, and the quantity of this Dr. Halley gives in the Philosophical Transactions, N°. 197. The law of the expansion of air is this, that the spaces into which air of a given quantity is compressed, are reciprocally proportionable to the compressing weights.

The word is Latin, *expansio*, and derived from *ex*, out of, and *pando*, to stretch.

Dr. Gregory proves, in his Astronomy, that a globe of air, of but one inch in diameter, if it had so great an expansion as it will have at a semi-diameter's distance of the earth from it, would fill all the planetary regions far beyond the sphere of Saturn.

EX PARTE, a term used in the court of chancery, where a commission is taken out and executed by one side or party only, upon the other party's neglecting or refusing to join therein.

When both parties proceed together, it is called a joint commission.

EXPECTANT, in law, signifies having relation to, or depending on: thus, where land is given to a man and his wife, and to their heirs, they have a fee simple estate; but if it be given to them and the heirs of their bodies begotten, they have an estate tail, and a fee expantant, which is opposed to fee simple.

EXPECTORANTS, *Expectorantia*, in medicine, are such things as promote a discharge of whatever is offensive to the lungs and aspara arteria.

The word is Latin, *expectorans*, and derived from *ex* and *pectus*, the breast.

EXPECTORATION, in medicine, is the act of evacuating or bringing up phlegm, or other matter, from the lungs, by coughing, spitting, &c.

The word is Latin, *expectoratio*, and derived from *ex* and *pectus*, the breast.

EXPEDITATION, in the forest-law, is the cutting out the balls of dogs fore-feet, in order to preserve the king's game.

The word is Latin, *expeditatio*, and derived from *ex* and *pes*, a foot.

EXPENDITORS, the persons who disburse or expend the money collected by the tax for repairs of sewers, after the same is paid into their hands by the collectors, as ordered by the commissioners, and for which they are to render accounts when required.

EXPERIENCE, a kind of knowledge acquired by long use, without any teacher. Mr. Locke says, that men receive all the materials of knowledge from experience and observation. See the article IDEA.

Experience then consists in the ideas of things we have seen or read, which the judgment has reflected on, to form itself a rule or method.

EXPERIMENT, in philosophy, is the trial of the result or effect of the applications and motions of certain natural bodies, in order to discover something of their motions and relations, whereby to ascertain some of their phænomena, or causes.

Torricellian EXPERIMENT. See the article TORRICELLIAN.

EXPERIMENTAL PHILOSOPHY, that philosophy which proceeds on experiments, which deduces the laws of nature, and the properties and powers of bodies, and their actions upon each other, from sensible experiments and observations. The business of experimental philosophy is to enquire into and investigate the reasons and causes of the various appearances or phænomena of nature, and to make the truth or probability thereof obvious and evident to the senses, by plain, undeniable, and adequate experiments, representing the several parts of the grand machinery and agency of nature.

In our enquiries into nature we are to be conducted by those rules and maxims which are found to be genuine, and consonant to a just method of physical reasoning; and these rules of philophizing are by the greatest master in science, Sir Isaac Newton, reckoned four, which are as follow:

1. More causes of natural things are not to be admitted, than are both true, and sufficient to explain the phænomena; for nature does nothing in vain, but is simple, and delights not in superfluous causes of things.

2. And, therefore, of natural effects of the same kind, the same causes are to be assigned, as far as it can be done; as of respiration in man and beasts, of the descent of stones in Europe and America, of light

light in a culinary fire and in the ſun, and of the reflection of light in the earth and in the planets.

3. The qualities of natural bodies which cannot be increaſed or diminiſhed, and agree to all bodies in which experiments can be made, are to be reckoned as the qualities of all bodies whatſoever: thus, becauſe extenſion, diviſibility, hardneſs, impenetrability, mobility, the vis inertiæ, and gravity, are found in all bodies which fall under our cognizance or inſpection, we may juſtly conclude they belong to all bodies whatſoever, and are therefore to be eſteemed the original and univerſal properties of all natural bodies.

4. In experimental philoſophy, propoſitions collected from the phænomena by induction, are to be deemed (notwithſtanding contrary hypotheſes) either exactly or very nearly true, till other phænomena occur, by which they may be rendered either more accurate, or liable to exception. This ought to be done, leſt arguments of induction ſhould be deſtroyed by hypotheſes.

Theſe four rules of philoſophizing are premiſed by Sir Iſaac Newton to his third book of the Principia; and more particularly explained by him in his Optics, where he exhibits the method of proceeding in philoſophy, the firſt part of which is as follows.

As in mathematics, ſo in natural hiſtory, the inveſtigation of difficult things, by way of analyſis, ought always to precede the method of compoſition. This analyſis conſiſts in making experiments and obſervations, and in drawing general concluſions from them by induction (i. e. reaſoning from the analogy of things by natural conſequence) and admitting no objections againſt the concluſions, but what are taken from experiments or certain truths: and although the arguing from experiments and obſervations, by induction, be no demonſtration of general concluſions, yet it is the beſt way of arguing which the nature of things admits of, and may be looked on as ſo much the ſtronger, by how much the induction is more general; and if no exception occur from phænomena, the concluſion may be pronounced generally; but if at any time afterwards, any exception ſhall occur from experiments, it may then be pronounced with ſuch exceptions: by this way of analyſis we may proceed from compounds to ingredients, and from motions to the cauſes producing them; and, in general, from effects to their cauſes; and from particular cauſes to more general ones, till the argument ends in the moſt general: this is the method of analyſis: and that of ſyntheſis, or compoſition, conſiſts in aſſuming cauſes, diſcovered and eſtabliſhed as principles, and by them explaining the phænomena proceeding from them, and proving the explanations.

EXPERIMENTUM Crucis, a capital, leading, or deciſive experiment; thus termed, either on account of its being like a croſs, or direction poſt, placed in the meeting of ſeveral roads, guiding men to the true knowledge of the nature of that thing they are enquiring after; or, on account of its being a kind of torture, whereby the nature of the thing is as it were extorted by force.

EXPIATION, a religious act, by which ſatisfaction, atonement, or amends is made for the commiſſion of ſome crime, the guilt done away, and the obligation to puniſhment cancelled.

Great Day of Expiation, an annual ſolemnity of the Jews, upon the tenth day of the month Tiſri, which anſwer to our September.

Expiation, in a figurative ſenſe, is applied by divines to the pardons procured to mens ſins, by the merits of Chriſt's death.

EXPIRATION, in phyſic, that part of reſpiration whereby the air is expelled, or driven out of the lungs. See Respiration.

Expiration is alſo uſed for the end of any term agreed upon. It likewiſe ſignifies death.

EXPLOSION is properly applied to the going off of gunpowder, and the report made thereby; but it is frequently uſed to expreſs ſuch ſudden actions of bodies as have ſome reſemblance thereto; ſuch as the ſudden efferveſcence, ebullition, and expanſion that ariſe from the mixture of ſome contrary liquors; as ſpirit of nitre and ſpirit of wine; oil of vitriol and oil of turpentine; oil of vitriol and ſal ammoniac, &c.

The word is Latin, *exploſio*, and derived from *explodo*, to drive out.

EXPONENT, in algebra, is a number placed over any power, or involved quantity, to ſhew to what height the root is raiſed, in order to contract the work. Thus, $x^4 = xxxx$. Here 4 is the exponent of the power x, and ſhews that it is involved to the fourth power.

The word is derived from the Latin *expono*, to ſhew, or expound.

Exponent *of a Ratio* is the quotient ariſing from the diviſion of the antecedent by the conſequent.

Thus the ratio of 3 to 2 is $1\frac{1}{2}$, and the ratio of 2 to 3 is $\frac{2}{3}$. If the conſequent be unity, the antecedent itſelf is the exponent of the ratio: and, therefore, the exponent of a ratio is to unity, as the antecedent is to the conſequent.

Though the quotient, reſulting from the diviſion of the antecedent by the conſequent, is generally taken for the exponent of the ratio; yet, in reality, the exponent of a ratio ought to be a logarithm. And this ſeems to be more agreeable to Euclid's definition of duplicate and triplicate ratios, than quotients: for 1, 3, and 9, are continual proportionals; now, if $\frac{1}{3}$ be the exponent of the ratio of 1 to 3, and $\frac{3}{9}$, or $\frac{1}{3}$, the exponent of the ratio of 3 to 9, and $\frac{1}{9}$ the exponent of the ratio of 1 to 9; and ſince Euclid ſays, "If three quantities are pro-

FELONY, in law, a capital crime, next in degree to petit treaſon, and committed with evil intention; as murder, theft, ſodomy, rape, ſetting fire to houſes wilfully, &c.

FELT, in commerce, a kind of ſtuff, compoſed either of wool alone, or of a mixture of wool and hair, but neither ſpun nor wove, deriving all its conſiſtence from being fulled, or wrought, with lees and ſize.

FEMALE, a term peculiar to animals, and ſignifies that ſex which conceives and generates its young within itſelf.

The word is alſo applied, in a figurative ſenſe, to inanimate objects, from the reſemblance they bear to the female of animals: thus we ſay, a female ſcrew, a female flower, &c. See SCREW, FLOWER, &c.

FEMME COVERT, in law, a married woman. See COVERTURE.

FEMME SOLE, an unmarried woman, whoſe debts, contracted before marriage, become thoſe of her huſband after that ceremony has been performed.

FEMININE, in grammar, is that gender which denotes a female.

FEMUS, the thigh, in anatomy, is that part of the body intercepted between the buttocks and the knee. See the article THIGH.

FEN, a general name for boggy or marſhy land, commonly overflowed with water.

In draining theſe ſort of lands, which is the only method of making them uſeful, trenches and drains for carrying off the water muſt be formed, in order to render the ſurface dry, and of a proper conſiſtence for producing vegetables.

This may be attempted by various methods; but whatever mode of proceeding be adapted, the loweſt part of the ground is to be found out firſt, and the overflowing from great rains, and from land floods, muſt be provided for, in the carrying off that way; for, ſhould this be neglected, all the labour and coſt employed on the other principle would be thrown away. If it is found that this can be done, there muſt be afterwards cut a large drain through the middle of the land, and ſeveral ſmaller drains communicating with this.

The great drain muſt be dug deep enough to drain the whole level; and this, and all the others, muſt be made the narroweſt at the head, and wider all the way to the mouth, where it muſt be wideſt of all.

Theſe drains muſt be all well cleanſed from mud and weeds every ſpring and autumn, and the water from land-floods muſt be kept from coming in upon theſe lands, as much as poſſible, that there may be the leſs to be drained off; the lower edges of the fen-land muſt be for this purpoſe guarded with banks to turn the water into other channels. In Eſſex, they have many lands that lie below the high-water mark, and are above the low-water mark, and have land-floods or fleets running through them, which make a ſort of ſmall creek. Theſe lands they have a very eaſy way of draining, though they are naturally very moiſt, when they firſt incloſe them from the ſea; they do it with a bank, which they extend from one ſide of the land they deſign to take in, to the other, excepting a ſpace that they leave, where the creek or land floods run into the ſea. They then prepare a wooden frame, well planked, and of a conſiderable thickneſs, fitted to the head of the creek, and capable of ſhutting it wholly up; in this frame they make ſeveral holes, in which are placed wooden troughs, made each of four boards, and ſuited in ſize and number to the quantity of water that is to be diſcharged through them from the land-floods. Each of theſe trunks is open towards the creek, but on the ſea-ſide it has a door or flap, which opens when the land-flood preſſes againſt it, and gives it free paſſage out; but, when the ſea-water is riſen to the height of it and preſſes it, it is ſhut by the force, and no ſea-water is let in. When this head is prepared, they let it in, and, ſtopping up the whole creek, they continue the banks on each ſide till they meet it: thus all the land-floods are let out at low-water, and not a drop of ſea-water can be admitted, ſo that the lands are kept dry and uſeful, which were before rendered uſeleſs, by being drowned with ſalt-water at every high-water mark. The freſh-water of the creek is thus kept unmixed with the ſea-water, and therefore affords good drink for the cattle, which is commonly very difficult to be had in this ſort of lands, the tides ſpoiling what freſh-waters there are, every time they come up.

FENCE, in gardening and huſbandry, a hedge, wall, ditch, bank, or other incloſure, made round gardens, fields, woods, &c. The uſual fences about fields are hedges of either white or black thorn, crab, holly, alder, furze, &c. thoſe about parks are generally of oak paling, which is very durable, and ſome are incloſed with walls. The principal fence for gardens are walls, and particularly for kitchen-gardens, as they are not only the beſt ſecurity, but are of great uſe to ripen fruits which are of the tender kinds. See the articles WALLS and EXPOSURE. But with reſpect to pleaſure-gardens, walls ſhould be avoided wherever they may intercept the proſpect of the diſtant country; but where the objects are diſagreeable, they may be uſed: the moſt proper fence for a pleaſure-garden adjoining to a park, is a foſſe or kind of ditch, faced with an upright wall on the garden-ſide, about five or ſix feet high, with the ground regularly ſloping on the park ſide; by this method the view is continued without interruption, as the garden and park will appear blended in one. Another kind of fence is made by banking up the earth. See the article EARTH-BANKS. In Devonſhire, and other places where ſtones are plenty,

they make their fences with two ſtone walls at a proper diſtance, filling up the ſpace between with earth, to any height or width at pleaſure: on the top not only quickſets are planted, but timber trees thrive very well on them. Beſide the above-mentioned, there are other kinds of fences, ſuch as poſts and rails, rope and net fences, reed fences, chevaux de frize to hinder the approach of cattle, &c.

FENCE-MONTH, the month wherein deer begin to fawn, during which it is unlawful to hunt in the foreſt.

It commences fifteen days before Midſummer, and ends fifteen days after it. This month, by ancient foreſters, is called defence-month. There are alſo fence-months, or ſeaſons, for fiſh as well as wild beaſts, as appears by Stat. Weſt. 13 Geo. II.

FENCING, the art of making a proper uſe of the ſword, as well for attacking an enemy, as for defending one's ſelf.

FENDERS, among ſailors, certain pieces of rope, wood, faggots, or other materials, hung over the ſide of a ſhip or boat, to prevent them from ſtriking or rubbing againſt each other, when they lie cloſe together; alſo to prevent ſhips, boats, and other veſſels from bearing againſt a wharf or key.

FENDUE *en Pal*, in heraldry, a croſs clove down in pale, that is, from top to bottom, and the two parts ſet at ſome diſtance from each other.

FENESTRA, in anatomy, a term applied to two openings or foramina within the ear, diſtinguiſhed by the names of the oval and the round feneſtra.

FENNEL, *fœniculum*, in botany, an umbelliferous plant, whoſe root is white, ſtrait, of a ſweetiſh aromatic taſte, and perennial; the ſtalk is annual, ſtrait, round, jointed, ſmooth, ſlender, and covered with a greeniſh rind; it is full of a ſpungy white pith, and divided into many wings towards the top; the leaves are of a dark green, and divided into long capillary ſegments, with a ſweet pungent taſte and ſmell, the flowers grow in umbels at the ends of the branches, in July, and are roſaceous, conſiſting of five yellow incurved petals; the ſeeds are oblong, thick, and channeled, gibbous on one ſide and plane on the other. The leaves, roots, and ſeeds, are uſed in medicine; the root being one of the five opening roots, and the ſeed one of the greater carminative ſeeds.

Sweet FENNEL differs but little from the former, only the ſtalk is not ſo high nor ſo thick, and the leaves are leſs, but the ſeeds are longer, narrower, ſtreaked and whitiſh, of a more ſweet and aromatic taſte, with nothing of the pungency of the other ſort; ſweet fennel ſeed is accounted carminative and attenuant, conſiderably diuretic and ſudorific, and is recommended as a ſpecific in the meaſles, ſmall-pox, and malignant fevers. The roots of fennel have exactly the ſame ſmell and taſte of the celebrated gingſeng of the Chineſe; and, according to Boerhaave's opinion, it may be a very good ſubſtitute.—In the Linnæan ſyſtem of botany, fennel is claſſed with the anethum, which ſee.

FENUGREEK, in botany. See the article FOENUGREEK.

FEOFFMENT, in law, is a gift or grant of any manors, meſſuages, lands, or tenements, to another in fee, that is, to him and his heirs for ever, by delivery of ſeiſin, and poſſeſſion of the eſtate granted.

FERALIA, in antiquity, a feſtival obſerved among the Romans, on the twenty-firſt of February; or, according to Ovid, on the ſeventeenth of that month, in honour of the manes of their deceaſed friends and relations.

FER DE FOURCHETTE, in heraldry, a croſs, having at each end a forked iron, like that formerly uſed by ſoldiers to reſt their muſkets on. It differs from the croſs fourché, the ends of which turn forked, whereas this has that ſort of fork fixed upon the ſquare end.

FER DE MOULIN, *Milrinde*, *Inke de Moulin*, in heraldry, is a bearing ſuppoſed to repreſent the iron-ink or ink of a mill, which ſuſtains the moving mill-ſtone.

FERIÆ, in Roman antiquity, holidays, or days upon which they abſtained from work.

FERIAL DAYS, according to the Statute 27 Hen. VI. cap. v. are taken for all days of the week except Sunday.

FERMENT, any body which, being applied to another, produces fermentation.

Ferments are either matters already in the act of fermentation, or that ſoon run into this act. Of the firſt kind are the flowers of wine, yeaſt, fermenting beer, or fermenting wine, &c. and of the ſecond are the new expreſſed vegetable juices of ſummer fruits.

Among diſtillers, ferments are all thoſe bodies which, when added to the liquor, only correct ſome fault therein, and by removing ſome obſtacle to fermentation, forward it by ſecondary means; as alſo ſuch as being added in time of fermentation, make the liquor yield a larger proportion of ſpirit, and give it a finer flavour. See the article ADDITION.

FERMENTATION, the inteſtine motion excited in vegetables, by which they are changed in ſuch a manner, that the firſt thing that riſes from them in diſtillation is acrid, mixible with water, of a warm aromatic taſte, inflammable like oil, thin and volatile; or elſe acid, that will extinguiſh fire and flame, and is leſs thin and volatile.

The word is Latin, *fermentatio*, and derived from *fermentum*, leaven.

A certain degree of warmth ſeems requiſite, in the northern climates, to all artificial liquors intended for immediate fermentation, eſpecially in the winter:

winter: but the natural juices of vegetables that have never been inſpiſſitated, as that of grapes, and other fruits, when fully ripened, will uſually ferment as ſoon as they are expreſſed, without any external aſſiſtance. But as a certain degree of inſpiſſation prevents all tendency to fermentation in vegetable juices, otherwiſe ſtrongly diſpoſed to ferment; ſo a long continuance or increaſe of the inſpiſſating heat, eſpecially if it acts immediately, through a metalline or ſolid body, upon the juice, will deſtroy its fermenting property; and this the more effectually, as the heat employed approaches to that of ſcorching, or the degree capable of giving an empyreuma. After the ſame manner, ſeveral experiments make it appear, that there is a certain degree of heat, the continuance, or leaſt increaſe whereof, proves detrimental, or deſtructive to fermentation, as there is another that wonderfully encourages and promotes it. Theſe two degrees of heat ought to be carefully noted and ſettled by the thermometer, or other more certain method, for philoſophical and chemical uſes; but for common or œconomical occaſions, they may be limited to what we uſually underſtand by a tepid and a fervid heat: a fervid heat is the bane of all vinous fermentation; as a tepid one, or rather an imperceptible warmth, is the great promoter thereof. In this neutral ſtate therefore, with proper contrivances to preſerve and continue it, the liquor is to be put into a ſuitable veſſel for fermentation; at which time, if it work not of itſelf, it muſt be quickened by additions; and, in general, by ſuch things as are properly called ferments. See FERMENT.

When thus the proper quantity of a good-conditioned and ſuitable ferment is got ready, it muſt be put to the fermentable liquor in the bare tepid, or ſcarce luke-warm ſtate above-mentioned. The beſt manner of bringing them together, for raiſing the fermentation quick and ſtrong, ſeems to be this: when the ferment is ſolid, it ſhould be broke into ſmall pieces, and gently thinned, with the hand, or otherwiſe, in a little of the luke-warm liquor: but a complete uniform ſolution ſhould not be here endeavoured, becauſe this would, in ſome meaſure, weaken the power of the ferment, or deſtroy its future efficacy. The whole intended quantity therefore, being thus looſely mixed with a moderate quantity of the liquor, ſhould be kept in a tepid ſtate, free from the action of the external air; and at proper intervals more of the warm liquor ſhould be added, till the whole quantity is well ſet to work together: and thus, by dividing the buſineſs into parts, it may be much more ſpeedily and effectually performed.

FERMENTED, in general, ſomething that has undergone a fermentation. See the preceding article.

FERN, *filix*, in botany. There are ſeveral kinds of fern in different parts of the world: but we ſhall only mention two ſorts. The male fern (which Linnæus has claſſed with the polypodium: and the female fern or brakes, which he calls pteris.

The leaf of the male fern is compoſed of ſeveral other leaves, which adhere to a rib in ſuch a manner as to have lobes on both ſides, cut into the depth of the main fibre.

The common female fern, or brakes, has many large leaves divided into ſeveral branches, beſet with long, narrow, ſtiff pinnulæ, which are moſtly ſmooth about the edges, though ſometimes they are a little indented: the back of theſe, about Midſummer, will be covered round the margins with a great number of duſky brown particles, which are the ſeeds.

The ſeeds of the ſeveral ſpecies of fern were wholly unknown to the ancients. Swammerdam, in his Biblia Naturæ, claims to himſelf the honour of having firſt diſcovered them; but it appears from Hook's works, that Dr. William Cole ſent an account of the ſeeds of ſeveral of the plants of this kind to that author, in 1669; whereas Swammerdam declares his diſcovery of them to have been in 1673; ſo that it is plain that Dr. Cole's was prior to his by ſome years. Swammerdam is an author of that ſtrict probity, that there is no room to doubt but that he ſpoke what he thought to be true; and it is even poſſible that he might have diſcovered them ſooner than the time he mentions; but, however that be, it appears from the later obſervations of the ingenious Dr. Miles, that his accounts are extremely accurate and juſt. The ſeed-veſſels of the common fern, the Engliſh and foreign maiden-hairs, the wall-rue, hart's-tongue, and the like plants, are all alike in their general form, their only differences being in the ſize, and their arrangement on the plants. The number or quantity of the ſeeds is very different in different plants; but Dr. Miles obſerves, that, the fewer ſeeds there are in any ſpecies, there is always the more in quantity of a ſort of ſpongy or fungous matter, which forms a kind of tubercle, not unaptly reſembling what is called Jew's-ears, which ſeems a ſubſtance intended for the ſheltering the ſeeds.

Theſe ſeed-veſſels conſiſt of a ſtalk, by which they are inſerted into the leaf; this repreſents an elaſtic cord, and is ſurrounded by a great number of annular ribs, reſembling the cartilages of the aſpera arteria; and indeed nothing in nature ſo exactly reſembles this cord or ſtalk, as the wind-pipe of a ſmall bird. This cord incircles the globular membranous pod, wherein the ſeeds lie, adhering to it, and dividing it into two hemiſpheres.

The pod is compoſed of a fine whitiſh membrane, ſomewhat like that which lines the inſide of a pea-ſhell; the ſeeds are irregular in ſhape, and of a reticulated ſurface. The moſt advantageous way of viewing this is to uſe the common microſcope, for opake

opake objects, putting on a small magnifier, and laying the seeds with their capsules, &c. as taken from the back of the plant, on a piece of polished ivory. The proper time of the year is in the beginning of September; and then, if the plant be newly gathered, the seed-vessels often burst, while they are under inspection, and shew a very elegant appearance. The manner of this bursting of the pod, which is the method nature has taken for the scattering and dispersing of the seed, is this: the cord becomes extended in some one part, and soon after breaks asunder; this by expanding bursts the pod into two parts, and, continuing to expand itself, as it departs from a curve, and approaches to a right-line, it rends itself away from the globular pod, till it be at length wholly disengaged from it; and then, as there can be no farther resistance given to its expanding, it suddenly flies off, with a sort of jerk, and becomes quite straight at once. By this last action the capsules are shook, and the seeds are discharged out of them on the plate of ivory, in the same manner as the grains of wheat or barley would be thrown out of a bowl placed on a table by the shaking of the bowl.

FERN *Oil*, in pottery, a name given, by the English merchants who have been in China, to a sort of varnish, which the Chinese use in their porcelain manufactories. See CHINA.

FERRET, *Viverra*, in zoology, a quadruped of the mustela kind.

The head is small and depressed; the snout sharp; the eyes look very fierce and red; the ears are short, patulous, and erect, they are considerably wide, especially towards the base; the mouth is large, and the teeth are very sharp; the neck is short; the body is long and thin; the legs are short, and each divided at the foot into five toes, and they are armed with sharp claws. This animal is very common in England, but is a native of America.

FERRETS, in glass-making, the iron with which the workman tries the melted metal to see if it be fit to work.

It is also used for those irons which make the ring at the neck of bottles. *Neri's Art of Glass.*

FERRETTO, in the glass trade, a substance which serves to colour glass. This is made by a simple calcination of copper, but it serves for several colours. There are two ways of making this; the first is this: take thin plates of copper, and lay them on a layer of powdered brimstone, in the bottom of a crucible; over these lay more brimstone, and over that another layer of the plates, and so on alternately, till the pot is full. Cover the pot, lute it well, place it in a wind furnace, and make a strong fire about it for two hours. When it is taken out and cooled, the copper will be found so calcined, that it may be crumbled to pieces between the fingers, like a friable earth; it will be of a reddish, and in some parts a blackish colour. This must be powdered and sifted fine for use.

The other way is less easy, but it makes a more valuable ferretto. It is this: make a number of stratifications of plates of copper and powdered vitriol alternately in a crucible, which place in the floor of the glass furnace, near the eye, and let it stand there three days; then take it out, and make a new stratification with more fresh vitriol, and calcine it again as before; repeat this operation six times, and a most valuable ferretto is produced. *Neri's Art of Glass.*

FERRUGINOUS, any thing partaking of iron, or that contains particles of that metal. It is particularly applied to certain mineral springs, whose waters are impregnated with particles of iron, generally called chalybeates.

The word is Latin, *ferrugineus*, and derived from *ferrum*, iron.

FERRUGO, RUST. See the article RUST.

FERRUM, IRON. See IRON.

FERTILITY, that quality which denotes a thing fruitful or prolific.

FERULA, fennel-giant, in botany, a genus of umbelliferous plants, the compound flower of which is uniform, and the particular ones made up of five oblong erect petals with the same number of stamina; the fruit is of an elliptical compressed form, dividing in two parts, each having a plane seed of the same figure.

FERULÆ, in surgery, splinters or chips of different matter, as of wood, bark, leather, paper, &c. applied to bones that have been disjointed, when they are set again.

FESSE, in heraldry, one of the nine honourable ordinaries, consisting of a line drawn directly across the shield, from side to side, and containing the third part of it, between the honour-point and the nombril.

It represents a broad girdle or belt of honour, which knights at arms were anciently girded with.

FESSE POINT is the exact center of the escutcheon. See the article POINT

FESSE WAYS, or *In* FESSE, denotes any thing borne after the manner of a fesse; that is, in a rank across the middle of the shield.

Party per FESSE implies a parting across the middle of the shield, from side to side, through the fesse-point.

FESTI DIES, in Roman antiquity, certain days in the year devoted to the honour of the gods.

FESTINO, in logic, the third mood of the second figure of syllogism, the first proposition of which is an universal negative, the second a particular affirmative, and the third a particular negative, as in the following example:

FES No bad man can be happy,
TI Some rich men are bad men:
NO *Ergo*, Some rich men are not happy.

FESTIVAL, the same with feast. See the article FEAST.

FESTOON, in architecture and ſculpture, &c. an ornament in form of a garland of flowers, fruits, and leaves, intermixed or twiſted together.

It is in the form of a ſtring or collar, ſomewhat biggeſt in the middle, where it falls down in an arch; being extended by two ends, the extremities of which hang down perpendicularly.

Feſtoons are now chiefly uſed in friezes, and other vacant places, which want to be filled up and adorned; being done in imitation of the long cluſters of flowers, which the ancients placed on the doors of their temples and houſes on feſtival occaſions.

FESTUCA, in botany, a genus of graſſes, the flower of which is compoſed of two valves, and terminated by a ſtrait ariſta or awn; the ſeed is ſingle, oblong, very ſharp pointed at each end, and marked with a longitudinal furrow.

FETLOCK, in the menage, a tuft of hair growing behind the paſtern-joint of many horſes; for thoſe of a low ſize have ſcarce any ſuch tuft.

FEUD, *Feodum*, the ſame with fee. See the article FEE-ESTATE.

FEUDAL, or FEODAL, denotes any thing belonging to a fee. See the article FEE.

FEUDATARY, or FEODATARY, a tenant who formerly held his eſtate by feodal ſervice. See the article VASSAL.

FEVER, FEBRIS, in medicine, a diſeaſe, or rather claſs of diſeaſes, whoſe characteriſtic is a preternatural heat felt through the whole body, or at leaſt the principal parts of it.

All fevers, of what kind ſoever, are attended with a preternatural heat of the blood and humours, which impairs the bodily ſtrength and its vital functions: wherefore nature raiſes all her forces, and engages the diſeaſe as a mortal enemy; and, if ſhe gets the better, drives out the cauſe of the diſorder by ſuch outlets as ſhe is able. This action is by phyſicians called the criſis of the diſeaſe.

As there is no fever cured without ſome conſiderable evacuation, raiſed either by nature or by art, the phyſician ought carefully to obſerve which way nature ſeems to intend the expulſion of the morbid matter, and to aſſiſt her by all poſſible means. Now this expulſion is very frequently made through ſeveral outlets of the body at a time; and an evacuation by one outlet, more or leſs, checks that by another; thus a looſeneſs checks a ſweat, and *vice verſa*: wherefore it is the phyſicians buſineſs to diſcern what evacuation is moſt likely to be of ſervice, and ſo to promote this, as to give the leaſt interruption poſſible to any other; for any one evacuation is not equally ſuitable to all perſons, both on account of the difference of conſtitution and of diſeaſes; although evacuations through every emunctory are ſometimes neceſſary, as we find by experience in malignant fevers.

But of all ſolutions of the diſeaſe the moſt deſirable is by ſweat; next to that by ſtool and urine; the worſt is by a hæmorrhage, whether it proceeds from the noſe, or from any other part, becauſe it indicates, that the blood is ſo far vitiated, that no proper ſeparation of the humour can be made.

Laſtly, ſome fevers terminate in abſceſſes formed in the glands, which, if they happen in the decline of the diſeaſe, and ſuppurate kindly, are ſalutary: wherefore the ſuppuration is to be forwarded by cataplaſms or plaſters, and ſometimes by cupping on the tumour; and then, if the abſceſs does not break ſpontaneouſly, it ought to be opened with the knife or a cauſtic.

At this time this rule of practice is generally right, not to exhauſt the patient's ſtrength by evacuations of any kind: and yet in ſome caſes there is a neceſſity for drawing a little blood; as when the humours are in great commotion, and the heat exceſſive; for this remedy, prudently adminiſtered, makes the tumour ripen kindly, becauſe nature has always a great abhorrence of a turbulent ſtate.

Continual FEVERS.—There is no diſeaſe to which the uſeful precept, *principiis obſta*, is more applicable than to fevers; becauſe in the beginning it is generally eaſy to do good; but when the diſtemper has gained ground, the cure is often attended with difficulty: for a medicine, which early adminiſtered might have prevented the impending danger, frequently fails when the bodily ſtrength is exhauſted by the violence of the diſeaſe. However, a patient who applies late for aſſiſtance, is not to be abandoned to his fate; ſince it is certain, that thoſe diſeaſes, which in old times were aſcribed to the divine wrath, are frequently cured by natural means, even when they appear moſt deſperate: wherefore the phyſician ought to lay it down as an abſolute rule, never to be wanting in his duty.

And firſt, as blood-letting is a moſt excellent remedy in the beginning of all fevers; if it has happened to be neglected for ſome days, let us conſider whether it is ſtill proper to be ordered.

In caſe of intolerable pain in any part of the body, of difficulty of breathing, or a delirium, blood is to be taken away, according to the patient's ſtrength; with the lancet, if he be able to bear it; if too weak, by cupping; but if exceſſively ſo, by leeches: and if this may be done when the diſeaſe has got to the height, it ought, for ſtronger reaſons, to take place in the beginning: and let me obſerve by the way, that leeches are often of vaſt ſervice in a delirium. I have alſo ſometimes found, by experience, that pieces of lambs lungs, applied warm to the head, have carried off the phrenzy, by the exudation of the noxious or ſuperfluous humour.

FEVERS *attended with Eruptions*, the chief of which, after the ſmall-pox, meaſles, and plague, is the miliary fever, than which no fever puts on more various appearances. Puſtules, rough to the touch, break out ſooner or later all over the body; ſometimes red, ſometimes whitiſh, and again both

ſorts intermixed; at one time ſmaller, at another larger and more elevated, and of a bad ſmell. Sobbing and anxiety about the heart are very frequent ſyptoms, which are often followed by a delirium and convulſions. The diſeaſe runs into a conſiderable length; and if it happens to end too ſoon, without a ſufficiently perfect criſis, it often brings on a bad habit of body. The red pimples are not ſo dangerous as the whitiſh; and the more lively their colour, the ſafer they are. Hence it appears, that this fever is more owing to a defect of the humours, and the animal ſpirits in particular, than to any bad quality of the air; and that it requires different methods of cure, according to its different circumſtances.

But of what kind ſoever the puſtules are, blood is to be drawn in the beginning, if the patient hath ſtrength to bear it; unleſs he be actually in a ſweat, in which caſe blood-letting is either to be omitted, or at leaſt to be put off for a day or two, or to ſome other convenient time.

Now red puſtules bear bleeding much better than the whitiſh: and though in both ſorts bliſters are ſerviceable, yet they are more neceſſary in the latter; and they are to be applied to the neck, head, and all the limbs, at proper diſtances of time. After all, I would adviſe the phyſician always to bear in mind, that the more ſparingly blood has been drawn, the more happily the diſeaſe generally terminates: for when the ſtrength has been exhauſted by evacuations towards the latter end, the eruption ſinks in, and the patient dies.

Nature's endeavours to expel the morbific matter through the ſkin, are to be aſſiſted by moderately cordial medicines. Of this tribe the moſt proper are the bezoardic powder, the compound powder of contrayerva, and the cordial confection; adding nitre in caſe of an inflammation: and this ſalt may be very advantageouſly joined to cordial medicines in almoſt all malignant fevers, at leaſt in the beginning. Toward the decline, warm bathing is ſometimes ſerviceable, in order to bring forth the remains of the puſtules.

But if, either at the height, or on the decline of the fever, the only appearance of an eruption is a vaſt number of pellucid veſicles, ſo ſmall as hardly to be ſeen: it is not ſafe to perſiſt too long in the uſe of internal medicines of this tribe, unleſs the length of the diſtemper has ſo far weakened the patient, as to render even more powerful cordials neceſſary: for ſuch little roughneſſes of the ſkin are not able to bring on a good criſis, but on the contrary, generally denote a difficult and tedious illneſs; wherefore, without diſcontinuing the bliſters, the cauſe of the diſeaſe is to be carried off by other ways, eſpecially through the inteſtinal canal by gentle purges of rhubarb, or manna and Glauber's ſalts.

It is to be obſerved, that this diſeaſe is not always terminated by any one ſort of criſis; it has ſometimes one ſort, ſometimes another; and, in ſome caſes, ſeveral ſorts together, as frequently happens in other malignant fevers. Thus, at the ſame time that there are other diſcharges of the morbific matter, a thruſh ſometimes breaks out, and ſpreads all over the mouth and throat. This commonly begins with a hiccup; and if it be whitiſh and very moiſt, and occaſion a plentiful ſpitting, it is ſo far from portending any great danger, that it is a ſign of the diſtemper's ending happily; but if it be of the black kind and dry, and the ſpittle rough and little in quantity, it is a fatal omen, as it indicates the mouth and throat choaked up with ſlimy phlegm. In theſe caſes, it is proper to uſe gargles made of barley-water and ſyrup of mulberries, or ſome ſuch other ſyrup, or the pectoral decoction: for repellents of all kinds are to be carefully avoided.

It may poſſibly ſeem ſtrange to ſome, that Sydenham preſcribes the bark in this fever, and the aphthæ attending it, who ſays, he always found it to anſwer his expectations. But this was not a raſh practice in that ſagacious phyſician; for this fever often intermits when the aphthæ do not appear; but it more frequently ends upon their going off. In both caſes this excellent antidote is of very great ſervice. Sydenham was the firſt, among us, who deſcribed this fever; which, he ſays, took its riſe here in the month of February 1684, after the long ſevere froſt of the preceding winter. Hence it is probable, that it aroſe from the acrimony of the humours, induced by the conſtruction of the fibres of the ſkin from cold, and the conſequent diminution of perſpiration.

The Petechial FEVER.—The petechæ, from which this fever has its name, are broad red ſpots, like the bites of fleas, not riſing above the ſurface of the ſkin. When they are livid or black, they are of very dangerous prognoſtic; becauſe they are really ſo many little gangrenes; and therefore, the more numerous they are, the more their conſequence is to be dreaded.

The common practice of giving hot medicines in the beginning of this diſtemper, in order to raiſe ſweats, is quite wrong. It is much the ſafer way to check the gangrenous diſpoſitions of the humours by the bezoardic powder, or rather the compound powder of contrayerva, with nitre, as is before mentioned; or to aſſiſt nature with the cordial confection diſſolved in ſimple alexeterial water; and alſo to acidulate the patient's drink with dulcified ſpirit of nitre; to repair his ſtrength with Rheniſh wine; and, in fine, a very proper drink will be barley-water with juice of lemons: and all theſe liquors are to be drank plentifully. It will likewiſe be of uſe ſometimes to adminiſter ſome doſes of the calx of antimony and bezoardic powder mixed, in order to provoke ſweat; but the calx ſhould not be too much waſhed: yet it is neceſſary to admoniſh, that it is not an uncommon caſe, eſpecially towards the

latter end of the diſeaſe, that the patient's weak low ſtate requires warmer cordials; ſuch as Virginia ſnake-root, contrayerva-root, the root of wild-valerian, ſaffron, and the like: and infuſions of theſe in water will be far more convenient than any other powder, eſpecially if they be mixed with a ſmall quantity of diſtilled vinegar.

Intermitting FEVER.—That this is not carried off by the Peruvian bark with a proper degree of certainty, without premiſing a vomit or a purge, or both, is not unknown to phyſicians; but to join ſome mild cathartic to this remedy will perhaps appear new in practice: for it is commonly thought, among us, that this medicine has little or no effect, unleſs the patient be coſtive while he takes it: but long experience has taught me, that it is quite neceſſary to add a ſmall quantity of rhubarb to this febrifuge, ſo as to procure two ſtools at leaſt every day: nor have I ever obſerved that this procedure has leſſened its virtue, but rather rendered it more efficacious; for although ſtrong irritating cathartics raiſe ſuch diſturbances in the blood and humours, as make the proper medicines ineffectual; yet moderate purging is attended with this good effect, that the ſtomach better digeſts whatever is taken in, whether medicines or food; whereby their fineſt and moſt wholeſome parts paſs into the maſs of blood.

The occaſion of my contriving this method of giving the bark was this: about five and thirty years ago, intermettent fevers, of a worſe ſort than ordinary, were very rife, and frequently terminated in a bad habit of body, and even in a dropſy; which conſequences, when I had maturely conſidered, I thought that this method might probably guard againſt them; nor was I deceived in my opinion: and the ſucceſs with which it was attended, encouraged me to purſue it, whenever this diſeaſe attacked bodies loaded with groſs humours: but I was well aware of the danger of purging too much; for after having given a drachm or two of rhubarb in this manner, it was my uſual cuſtom to omit the purgative, and continue the uſe of the febrifuge alone: and, beſides the advantages already recited, I made this obſervation, that when the diſeaſe is carried off by this method, there is always leſs danger of a relapſe.

Now, with regard to this noble medicine, I have this one admonition to give, that it is not proper in any other fevers but thoſe of the intermittent kind: for in continuals it is ſo far from being of ſervice, that it does much miſchief; and it is alſo pernicious in thoſe hectics which are accompanied with ulcers of any kind of the internal parts; though they often have periodical returns, and much reſemble quotidian or tertian intermittents: whence it may not perhaps appear an improbable conjecture, that this medicines operates on the bile alone; for that the bile has a conſiderable ſhare in cauſing intermitting fevers I have not the leaſt doubt.

However, it ſometimes happens that this febrifuge fails in true intermittents; which failure is generally owing to a bad habit of body: wherefore the phyſician ſhould uſe his beſt endeavours to diſcover in what part the fault lies, and it will be commonly found to be in the viſcera and glands of the abdomen: upon this account it will be neceſſary to preſcribe ſome purges, and ſometimes vomits; and in the intermediate days deobſtruents and ſtomachics, the beſt of which are aromatic bitters and preparations of ſteel: and for the ſame reaſon it is, that quartans are of more difficult cure than any other intermittents; for in theſe the blood and humours are inert and exceſſively viſcid; ſo that there are two diſeaſes to be conquered together, the bad habit of body and the fever; which is generally done effectually, by joining Virginia ſnake-root and ſteel with the bark: however, it may not be improper to take notice, that in ſome caſes where the bark did not anſwer, I have taken off intermitting fevers with a powder compoſed of chamomile flowers, myrrh, ſalt of worm-wood, and a little alum.

But there is more danger attending that ſort of intermitting fevers, by the Greeks named ἡμιτριταῖος, that is, ſemitertian. This fever returns every third day; and of forty-eight hours the fit commonly takes up about thirty-ſix, more or leſs; nor does the fever go off entirely, but only remits between the paroxyſms. Hence Galen was right in ſaying, that it was compounded of a continual, quotidian, and an intermitting tertian.

Thus a particular regard is due to this diſeaſe, which ſeems to be cauſed by an inflammation of ſome internal parts, accompanied with obſtructions from bilious humours and too viſcid lymph: wherefore blood is to be drawn once or oftener, according to the patient's ſtrength; and gentle purgatives, ſuch as the diuretic ſalt, manna with Glauber's ſalt, and the like, are to be ordered and repeated at proper diſtances of time; nor ought we to be haſty in giving the bark, for fear it ſhould increaſe the inflammation by adding to the obſtruction of the viſcera, and bring on a hectic. It will be much ſafer, firſt, to order the ſaline draughts, with juice of lemons, ſalt of wormwood, and ſimple cinnamon-water, to be taken frequently.

Epidemic FEVERS.—Theſe are cauſed by ſome fault in our ambient air; and that is chiefly owing to the exceſs of heat, cold, drought, or moiſture, or to the unſeaſonable viciſſitudes of theſe qualities.

In Greece and Aſia, where the ſeaſons are generally uniform, and the winds pretty regular for certain but different quarters in the different months of the year, it was eaſy for men of ſagacity to obſerve the changes of the weather, with their good and bad effects:

effects: and on a long use of this method of observation was built the art of prognostic in diseases, wherein Hippocrates, the father of physic, first excelled.

But in our climates, such is the inconstancy of the weather, and so many are the causes that raise different and even contrary winds on a sudden, that it seems impossible to erect any solid superstructure on that foundation: and accordingly Sydenham, who, in imitation of Hippocrates, attempted to describe the fevers of each respective year, and to account for their differences from the differences of the weather and seasons, found at length "That he had made no progress in discovering the causes of epidemical diseases by observing the manifest qualities of the air; as having remarked that in different years, which agreed perfectly well in the visible temperature of the air, the reigning diseases were very different, and so on the contrary; and likewise, that there are various constitutions of years, which depend not on heat, cold, drought, or moisture, but on some occult and inexplicable alteration in the very bowels of the earth."

Now this matter, in my opinion at least, stands thus: that the manifest qualities of the air have a considerable share in producing epidemic diseases, is a point that admits of no doubt; but there are other conjunct causes which alter the force of those qualities, either by increasing or diminishing them. These chiefly spring from the earth, as Lucretius wisely said:

——*ubi putorem humida nacta est,*
Intempestivis pluviisque et solibus icta.

When she's grown putrid by the rains and sweats
Such noxious vapours, press'd by scorching heats.

Now as this terrestrial putridity is chiefly occasioned by rotted vegetables, and sometimes also by the dead bodies of animals, and by minerals; so the waters, especially of lakes and morasses, which have their plants and animals, in the same manner frequently exhale pestilential vapours, which infect the circumambient air. In this class may be ranged, though rarely happening in our climates, inundations, earthquakes, eruptions from mountains, and all other remarkable and uncommon phænomena of nature, which are capable of filling the air we breathe, with particles offensive to animal life: for these affect our bodies, and prepare them for the easy reception of diseases.

Slow or hectic FEVERS.—These are owing to so many different causes, that they may well seem not to be the same, but different diseases. Of all this tribe, the most pernicious are those which arise from an ulcer in any particular part of the body, the lungs especially, by the purulent matter mixing with the blood, and disturbing its natural motion.

Bilious or Choleric FEVER, a species of acute fever, owing its origin to distemperatures of the bile.

The general signs of the bilious or choleric fever, are a remarkable anxiety, and frequent complaints about the breast, as of a straitness and painful heat. A violent heat on the inside of the mouth, and insatiable and intolerable thirst, trembling and convulsive motions of the joints, and violent deliriums. Dryness of the mouth and tongue are often so terrible in this disease, that the skin cracks with it; and often the whites of the eyes, sometimes the whole body, becomes yellowish. The peculiar and appropriated symptoms of a cholerica febris, strictly so called, are an universal languor and debility of the limbs.

A severe shivering first seizes the patient, and is soon succeeded by a very violent heat, and raging pain in the head; and, after the two first days, there usually are very terrible strainings and reachings to vomit. The matter brought up at these times is caustic, acrid, and bilious, and inflames and even ulcerates the fauces; and, if voided upon a stone floor, effervesces violently. If this vomiting abates, there immediately comes on a diarrhœa attended with a tenesmus, occasioned by the irritation of this sharp matter in the rectum. Faintings also are very frequent in this disease, especially where the vomitings do not bring up a sufficient quantity of the offending matter. The peculiar and appropriated signs of the causes, strictly so called, are these: a violent and insatiable thirst, greater than that in any other fever. The bowels are always bound, and it is but very seldom that there is any tendency to vomit. The urine is reddish and turbid, and, after standing some time, deposits a red sediment. Often there is a sensible pain and soreness in the præcordia, so that the patient cannot bear the least touch upon the breast; and usually, in the course of the disease, there are faintings and violent convulsions.

Persons most subject to this disease are such as eat largely, and drink heavy and imperfectly fermented liquors after it. The cholerica febris, properly so called, is most frequent with those of a cholerico-sanguineous habit, and such as feed on high-seasoned meats, and drink abundance of wine or other strong liquors; and is often brought on such persons by their falling into violent passions after a full meal. The causus peculiarly attacks the people of melancholic habits, who are much inclined to passion, but suppress it, and who are naturally costive.

Method of cure.—The cure of these diseases consists in the mitigating the violent sharpness of the humour, and promoting its evacuation; and, finally, in abating the burning heat brought on by it. The utmost endeavours are first to be made to correct and alter the morbific matter. To this purpose the several preparations of nitre, with the testaceous powders and mucilaginous ptisans, with small

ſmall mixtures of lemon-juice, and frequent draughts of cooling and diluting liquors, are to be given moderately warm. If the coſtiveneſs be too violent, clyſters of broth muſt be injected, with the addition of a little oil and ſalt; and, if neceſſary, ſmall doſes of rhubarb. To quell the febrile heat and emotion of the blood, the miſtura ſimplex may be given with great ſucceſs; and there is often a ſenſible good effect from the application of rags, wetted in camphorated ſpirit of wine, to the pit of the ſtomach. After the morbific matter is evacuated, the reachings to vomit may be allayed by gentle opiates. All hot medicines change the bilious fevers into inflammatory ones, and the common ſudorifics drive the morbific matter into the blood, and uſually bring on almoſt immediate diſcolourings of the ſkin, like thoſe of the jaundice. Bleeding, though performed ever ſo early in the diſeaſe, ſeldom does any good, except only in remarkable plethoric habits.

Colliquative FEVER is that in which the body is much emaciated and conſumed in a ſhort ſpace of time: the ſolid parts, and the fat itſelf waſte, ſometimes by a diarrœa, ſometimes by ſweat, by urine, or by feveriſh heats alone, without any ſenſible diſcharge. A colliquative fever is obſerved to accompany a cancer of the breaſt, with a diarrœa. See the articles DIARRHOEA, DIABETES, CANCER, &c.

For this diſeaſe, emulſions of almonds, and of the four cold ſeeds, as alſo aſſes, goats, or woman's milk are proper; or cow's milk with the juice of water-creſſes; chicken broth, broth made of river crabs, or wood ſnails bruiſed.

Diary FEVER, the ſame with ephemera. See EPHEMERA.

Gaol or *Camp* FEVER. See GAOL.

Hoſpital FEVER. See HOSPITAL.

Yellow FEVER. See the article *Bilious* FEVER.

FEVERFEW, *matricaria*, in botany, a genus of umbelliferous plants. whoſe flowers are compound and radiated, the hermaphrodite florets, which compoſe a hemiſpherical diſc, are numerous and tubuloſe, and contain each five capillary ſtamina; the female corollulæ, which form the rays, are ligulated, and contain a filiform ſtyle, terminated by two revoluted ſtigmas; the ſeeds are oblong, naked, and ſolitary, being contained in the cup, and placed on a convex naked receptacle.

The common feverfew has a white fibrous root, from which iſſues forth the ſtalks, which are round, ſtriated, branching, and full of a ſpungy pith; the leaves are of a light green colour, compoſed of three pair of lobes, which are cut into many ſegments, and terminated by an odd one. It flowers in June, and the ſeeds are ripe in autumn.

The whole plant has a very ſtrong ſmell; it is biennial, and grows wild in hedges and uncultivated places in many parts of England.

The leaves and flowers of feverfew is reckoned excellent in hyſteric and uterine diſorders. It is certainly a very good carminative, diſcuſſes wind, ſtrengthens the ſtomach, and helps digeſtion.

FEUILLANS, an order of barefooted monks, who obſerve the ſame rules with the Bernardines. See BERNARDINES.

FIAT, in law, a ſhort order or warrant ſigned by a judge, for making out and allowing certain proceſſes.

FIAT JUSTITIA, is where the king, on a petition to him for his warrant, to bring a writ of error in parliament, writes on the top of it, *fiat juſtitia*, "let juſtice be done;" upon which the writ of error is made out.

FIBER, the bever, in zoology, is made, by Linnæus, a ſpecies of caſtor. See the article BEAVER.

FIBRE, in anatomy, a perfectly ſimple body, or at leaſt as ſimple as any thing in the human ſtructure; being fine and ſlender like a thread, and ſerving to form other parts: hence ſome fibres are hard, as the bony ones; and others ſoft, as thoſe deſtined for the formation of all the other parts.

The fibres are divided alſo, according to their ſituation, into ſuch as are ſtraight, oblique, tranſverſe, annular, and ſpiral; being found arranged in all theſe directions, in different parts of the body; for an account of which ſee BONE, MUSCLE, NERVE, ARTERY, VEIN, &c.

FIBRE is alſo uſed to denote the ſlender filaments which compoſe other bodies, whether animal, vegetable, or mineral; but more eſpecially the capillary roots of plants. See PLANT, WOOD, &c.

FIBRILLA, a term ſometimes uſed for a very minute or ſlender fibre.

FIBROSE, ſomething conſiſting of fibres, as the roots of plants. See ROOT.

FIBULA, in anatomy, the outer and ſmaller bone of the leg, called alſo perone. It is nearly of a triangular figure, and ſtands parallel to, but diſtant from, the tibia, or inner bone of the leg. Its upper extremity does not reach to the os femoris, but is only joined to the external ſide of the tibia; and its lower extremity, called malleolus externus, concurs in the articulation of the tarſus, which its eminence ſerves to ſtrengthen, by rendering a luxation leſs eaſy. It has no particular motion of its own, but wholly follows that of the tibia.

FIBULÆUS, a muſcle of the leg, more uſually called peronæus. See PERONÆUS.

FICUS, the fig-tree, in botany, a genus of polygamious plants, producing male and female apetalous flowers; the ſtamina are three ſetaceous filaments, topped with twin anthera, and the female flowers have an inflexed ſtyle, terminated by two acuminated reflexed ſtigmas: the fruit is a large fleſhy turbinated recepticle, the interior ſides of which ſupport the flowers, which are incloſed

 within

within it, and is properly nothing but a common calyx, or cup of the fructification.

Fig trees are propagated either by layers or ſuckers; thoſe which are layed from fruitful branches are to be preferred, for thoſe which are raiſed from ſuckers are generally ſpungy, and are not only apt to produce little or no fruit, but being fuller of ſap than the layers are alſo liable to ſuffer by froſts in this climate. With us fig-trees are generally planted and trained againſt walls, but they will do very well in ſtandards, they may alſo be planted in eſpaliers, where their large leaves will entirely hide diſagreeable objects; and in order to ſecure them from being damaged in ſevere froſts, this is a very convenient form for protecting them with reed pannels, matts, &c. This laſt method we think the beſt, as they will produce greater quantities of figs than thoſe againſt walls, which frequently come out before the ſeverity of the ſeaſon is over.

The ſeaſon for pruning fig-trees is either in autumn or the ſpring, we think the month of February the beſt, as at that ſeaſon it is diſcoverable what branches have eſcaped the winter, when they may be pruned accordingly, training them regularly at about a foot aſunder, but they ſhould not be ſhortened, as the fruit is produced at the extremities of the branches; though it is not amiſs, where the branches are luxuriant, to pinch the end off, this will cauſe them to bleed, and may be a means of checking their growth, ſo as to produce branches more fit for bearing.

Fig-trees generally produce two crops in Italy and other warm countries; the firſt crop is little regarded, for it is the ſecond crop of figs that are produced from the ſhoots of the ſame year which is their principal crop; but theſe rarely ripen in England, as it muſt be an extraordinary fine autumn to have them fit to eat in November with us. The inhabitants up the Levant are very curious in the culture of their figs, for, without much pains, their fruit falls off and comes to nought, Tournefort, in his Travels, ſays that Pliny obſerved "that in Zia they uſed to dreſs the fig-trees with much care, and ſtill continued to do ſo". To underſtand right this huſbandry of figs (called in Latin *caprificatio*), we are to obſerve, that in moſt of the Archipelago iſlands they have two ſorts of fig-trees to manage, the firſt is called *ornos*, from the old Greek *erinos*; a wild fig-tree, or *caprificus* in Latin; the ſecond is the domeſtic or garden fig-tree: the wild ſort bears three kinds of fruits, fornites, cratitires, and orni, of abſolute neceſſity towards ripening thoſe of the garden fig. The fornites appear in Auguſt, and continue till November without ripening; in theſe breed ſmall worms which turn to a ſort of gnats, no where to be ſeen but about theſe trees; in October and November theſe gnats of themſelves make a puncture into the ſecond fruit, which is called cratitires, and do not ſhew themſelves till towards the end of September; and the fornites gradually fall away after the gnats are gone; the cratitires on the contrary remain on the tree till May, and incloſe the eggs depoſited by the fornites when they pricked them in May. The third ſort of fruit begins to put forth from the ſame wild fig-trees which produced the other two; this is much bigger, and is called orni; when it grows to a certain ſize, and its bud begins to open, it is pricked in that part by the gnats of the cratitires, which are ſtrong enough to go from one fruit to the other to diſcharge their eggs.

It ſometimes happens that the gnats of the cratitires are ſlow to come forth in certain parts, while the orni in thoſe very parts are diſpoſed to receive them; in which caſe the huſbandman is obliged to look for the cratitires in another part, and fix them at the end of the branches of thoſe fig-trees whoſe orni are in a fit diſpoſition to be pricked by the gnats; if they miſs this opportunity, the orni fall, and the gnats of the cratitires fly away: none but thoſe that are well acquainted with this ſort of culture know the critical minute of doing this; and, in order to it, their eye is conſtantly fixed on the bud of the fig, for that part not only indicates the time that the prickers are to iſſue forth, but alſo when the fig is to be ſucceſsfully pricked; if the bud be too hard and too compact, the gnat cannot lay its eggs, and the figs drop when this bud is too open.

Theſe three ſorts of fruit are not good to eat, their office is to help to ripen the fruit of the garden fig-trees in the following manner: during the months of June and July the peaſants take the orni at a time that their gnats are ready to break out, and carry them to the garden fig-trees; if they miſs the moment, the orni fall, and the fruit of the garden fig-tree not ripening, will in a very little time fall in like manner. To conclude, the peaſants ſo well order the orni, that their gnats cauſe the fruit of the garden fig-tree to ripen in the compaſs of forty days. Tournefort ſays, "I could not ſufficiently admire the patience of the Greeks, buſied above two months in carrying theſe prickers from one tree to another; I was ſoon told the reaſon; one of their fig-trees uſually produces between two and three hundred pounds of figs, whereas thoſe of Provence ſeldom above twenty-five." Theſe figs are very good green; when they would dry them, they lay them in an oven to keep them the reſt of the year. Barley bread and dried figs are the principal ſubſiſtence of the boors and monks of the Archipelago; but theſe figs are very far from being ſo good as thoſe dried in Provence, Italy, and Spain. The prickers contribute perhaps to the maturity of the garden fig, by cauſing to extravaſate the nutritious juice, whoſe veſſels they tear aſunder in depoſiting their eggs; perhaps too, beſides their eggs, they leave behind them ſome ſort of liquor proper to ferment

ment gently with the milk of the fig and to make their fleſh tender; for the figs in France ripen much ſooner by having their buds pricked with a ſtraw dipped in olive oil. The particulars of theſe circumſtances are confirmed not only at Zia, Tinos, Mycone, and Scio, but in moſt of the other iſlands of the Archipelago.

FIDD, among ſailors, a piece of wood or iron thruſt through a hole in the foot of the top-maſt, after it is drawn up to its utmoſt height. See MAST and TRUSSEL-TREES.

In the article CAP we obſerved, that it was uſed to keep ſteady the top-moſt above the frame of the top, as it is kept ſteady below by the truſſel-trees: the fidd reſts upon the truſſel-trees, and with it of courſe the whole weight of the top-maſt: the fidd-hole is therefore juſt above them when the top-maſts are erect.

FIDDLE-WOOD. See the article CITHAREXYLUM.

FIDE JUSSOR, among civilians, the ſame with a ſurety. See SURETY.

FIELD, *campus*, in agriculture, a piece of ground incloſed, whether for tillage or paſture. See TILLAGE and PASTURE.

FIELD, in heraldry, is the whole ſurface of the ſhield, or the continent, ſo called becauſe it containeth thoſe atchievements anciently acquired in the field of battle. It is the ground on which the colours, bearings, metals, furs, charges, &c. are repreſented. Among the modern heralds, field is leſs frequently uſed in blazoning than ſhield or eſcutcheon. See SHIELD, &c.

FIELD BOOK, in ſurveying, that wherein the angles, ſtations, diſtances, &c. are ſet down. See SURVEYING.

FIELD COLOURS, in war, are ſmall flags of about a foot and a half ſquare, which are carried along with the quarter-maſter general, for marking out the ground for the ſquadrons and battalions.

FIELD-FARE, in ornithology, the Engliſh name of the variegated turdus, with a hoary-head. See the article TURDUS.

It is larger than the common black-bird, and with us is a bird of paſſage, coming over in great numbers in the winter.

FIELD-FORT, in fortification. See FORT.

FIELD-OFFICERS, in the art of war. See the article OFFICER.

FIELD-PIECES, ſmall cannons, from three to twelve pounders, carried along with an army in the field. See CANNON.

FIELD-STAFF, a weapon carried by the gunners, about the length of a halbert, with a ſpear at the end; having on each ſide, ears ſcrewed on, like the cock of a match-lock, where the gunners ſcrew in lighted matches, when they are upon command; and then the field-ſtaffs are ſaid to be armed.

FIELD-WORKS, in fortification, are thoſe thrown up by an army in beſieging a fortreſs, or by the beſieged to defend the place. Such are the fortifications of camps, highways, &c.

Elyſian FIELDS. See ELYSIAN.

FIERI FACIAS, in law, a writ that lies where a perſon has recovered judgment for debt or damages in the king's courts againſt one, by which the ſheriff is commanded to levy the debt and damages on the defendants good and chattels.

FIFE, in muſic, is a ſort of wind-inſtrument, being a ſmall pipe. See PIPE.

FIFTH, in muſic, the ſame with diapente. See the article DIAPENTE.

FIG, the fruit of the ficus or fig-tree. See the article FICUS.

Figs, as well freſh as dry, are very wholeſome food; they are nutritive and emollient: they are alſo good in diſorders of the breaſt and lungs; but a too free uſe of them has ſometimes brought on obſtructions of the viſcera, a common complaint in the Levant. They are frequently made ingredients in our pectoral decoctions, and by ſome are greatly recommended againſt nephritic complaints. They are much uſed externally by way of cataplaſm, either roaſted or boiled in milk, for the ripening of tumours, and for eaſing the pain of the piles.

FIG-MARIGOLD. See MESEMBRYANTHEMUM.

Indian FIG. See OPUNTIA.

FIG, in farriery, a ſort of wart on the fruſh, and ſometimes on the whole body of a horſe. The figs that appear on the fruſh, or ſole, make an evacuation of malignant ſtinking humours, that are very hard to cure.

FIGHT. See BATTLE.

Sea-FIGHT implies, in general, an engagement, either between fleets of men of war, fleets of gallies, or ſingle ſhips.

The ancient Greeks, in preparing for an engagement at ſea, made it their firſt buſineſs to diſburthen their ſhips of war of all proviſions, and other lumber not neceſſary in the action, leſt by too heavy a load they ſhould be rendered unweildy, and unfit for ſervice, being neither able with force and vigour to aſſail their enemies, nor by lightly tacking about to avoid their onſets. This done, when the enemy appeared in view, they took down their ſails, lowered their maſts, and ſecured whatever might expoſe them to the winds, chuſing rather to be governed by oars, which they could manage at their pleaſure.

As to their order of battle, that was varied as time, place, and other circumſtances required; being ſometimes formed like an half-moon, and called σολος μηνοειδης, the horns jutting out towards the enemy, and containing the ableſt men and ſhips; ſometimes, on the contrary, having its belly neareſt the enemy, and its horns turned backwards, whence it was termed κυρτη παραταξις: nor was it unuſual

to

to range them in the form of a circle, which they called κυκλον ταξιν; or, to mention no more, in the figure of the letter V, with the horns extended in a direct line, and meeting at the end; which order was named επικαμπης παραταξις; in Latin, *forceps*; and was usually encountered by the enemies ranged into the same order inverted, whereby they resembled the figure of a wedge or beak, whence it was called *cuneus* or *rostrum*; this enabled them to penetrate into the body of the adverse battle.

Before they joined battle, both parties invoked the gods to their assistance by prayers and sacrifices; and the admirals going from ship to ship in some of the lighter vessels, exhorted their soldiers in a set oration, to behave themselves like men: then, all things being in readiness, the signal was given by hanging out of the admiral's galley a gilded shield, as we read in Plutarch; or a red garment or banner, which was termed αιρειν σημεια. During the elevation of this the fight continued, and by it depression, or inclination towards the right or left, the rest of the ships were directed in what manner to attack their enemies, or retreat from them. To this was added the sound of trumpets, which was begun in the admiral's galley, and continued round the whole navy. It was likewise usual for the soldiers, before the fight, to sing a pæan, or hymn, to Mars; and after the fight, another to Apollo.

The fight was usully begun by the admiral-galley, as we find done at the battle of Salamis, and another time by Attalus's ship: it was carried on in two different manners, for not only the ships engaged one another, and by their beaks and prows, and sometimes their sterns, endeavour to dash in pieces, or overset and sink their oppofers, but the soldiers also annoyed their enemies with darts and slings; and upon their nearer approach, with swords and spears. Thus Lucan:

Ut primum rostris crepuerunt obvia rostra,
In puppim rediere rates, emissaque tela
Æra texerunt vacuumque cadentia pontum.

The ships first meeting shew their fiercest rage,
And furiously with clashing beaks engage;
These turn about, and then the javelins fly,
And show'rs of arrows darken all the sky;
The sea is cover'd o'er.——

We find by the same author, that after this first onset, their ships approached so near each other as to be linked together with chains or grappling-irons, and then they fought with sword in hand. Sometimes for want of irons they so fixed their oars, as thereby to hinder their enemies from retreating; so we read in Lucan:

Seque tenent remis, toto stetit æquore bellum.

The ships they hold with oars, and all around
The face of horrid war appears.——

This sort of combat was not unlike a siege, where the stronger party, prevailing over their enemies, entered their vessels by laying bridges between them, and having killed, or taken prisoners, all they found in arms, seized and dragged away their ships.

When a town was besieged by sea, they used to environ its walls and harbour with ships, ranged in order from one side of the shore to the other, and so closely joined together by chains and bridges, on which armed men were placed, that, without breaking their order, there could be no passage from the town to the sea; this leaguer Diodorus calls ξευγμα. The better to prevent any attempts of the besieged, Demetrius is said to have invented a sort of boom armed with spikes of iron, which swam upon the waters; this he placed at the mouth of the harbour of Rhodes, when he besieged that city. Sometimes they blocked up the harbour, or made a passage to the town by raising a vast mole before it, as we read of Alexander in the siege of Tyre; or by sinking ships filled with stones and sand, as we find practised by the Romans.

The attacks were usually carried on by men standing upon bridges between the ships, and thence with darts and stones forcing the besieged from their walls: thus Alexander, in the siege of Tyre, so ordered his gallies, that two of them being joined at the heads, and the sterns somewhat distant, boards and planks were laid over in the fashion of bridges, for soldiers to stand upon, who were in this manner rowed close to the wall, where, without any danger, they threw darts at their enemies, being sheltered behind the fore-decks of their own gallies. Here, also, that they might throw their missive weapons with greater advantage, and batter the walls with their rams and other engines, they erected towers so high as to command the city walls, from which having repelled the defenders, they by this means had opportunity to descend by ladders.

The besieged were not at a loss for ways of defeating these stratagems; the ships linked together they pulled asunder with iron-hooks, the passage to the town they blocked up in the same manner the enemies had done that of the harbour, or otherways; if they could not hinder their approach, they failed not to gall them with darts, stones, fire-balls, melted pitch or metals, and many other things; and, lastly, to trouble you no farther, it was frequent for those in the town to destroy the vessels and works of the besiegers by fire-ships, as we find done by the Tyrians, who, taking a large vessel, put a great quantity of ballast into the stern, covered the head with pitch, tar, and brimstone, then by the help of sails and oars brought her close to the Macedonian fortress, where having set the combustible matter on fire, they retreated into boats prepared for that purpose; the fire immediately seized the towers of the fortification, and by the help of torches

torches and fire-brands caſt by thoſe in the boats, the work itſelf took fire, and that vaſt pile, on which ſo much time and labour had been beſtowed, was in a few moments quite demoliſhed. The uſe of fire-ſhips we likewiſe meet with amongſt the Rhodians in Diodorus the Sicilian.

We have obſerved above that the ancients ranged their ſhips or gallies ſo as to preſent them in front to their enemy; becauſe the machines they then made uſe of, were fixed in the heads or prows of their veſſels: the ſame reaſon now prevails with regard to the gallies, which are drawn up in the form of a creſcent, or half-moon, whoſe ends or horns are oppoſed to the enemy; in the middle of which is the admiral, from whence, he the more diſtinctly obſerves the motions of his fleet throughout. The two fleets being thus drawn up, approach each other to a convenient diſtance, when the battle beginning at the ends of the half-moon, extends inſenſibly till the whole fleet is engaged, and each partake of the danger and glory of the action. See compartment of plate LVI.

In an engagement of ſhips of war, the fleets are drawn up in two parallel lines upon a wind. The ſhips keep cloſe to the wind on the line they are formed in, and are commonly at a cable's length diſtance one from the other; the fire-ſhips, tranſports, tenders, &c. keeping at half a league diſtance on the oppoſite ſide of the enemy. Thus the fleets AB and CD, that are engaged, are ranged under an eaſy ſail, cloſe to the wind; and the fire-ſhips EE, of the fleet AB, are to windward; the fire-ſhips FF, are to the leeward of their fleet CD. This form was obſerved, for the firſt time, in the famous battle of the Texel, where the duke of York defeated the Dutch, on the 13th of June, 1665. See SQUADRON and LINE.

It is probably the moſt expedient method, as proved by experience, to keep a conſtant fire on the enemy, by firing in platoons, which will have a much greater effect, and diſtreſs them more, than the common received notion of broad-ſide and broad-ſide with ſome intervals between, which is generally the caſe in moſt actions; in order to which, I would divide the guns into five fires, in the following manner, viz. half the guns abaft below, then half the guns abaft aloft, ſo the other half below forward; and, laſtly, the quarter-deck guns, and thoſe on the fore-caſtle: ſo that, by the time your firſt platoon is fired, you will be able to keep up a conſtant fire on your enemy; which method I prefer, as I obſerved before, to broad-ſide and broad-ſide, where chance has often a greater ſhare in the execution than judgment; notwithſtanding, this laſt method is ſometimes neceſſary, as time and circumſtances may offer. I would likewiſe adviſe you to point your guns ſo as to make a breach in your enemy's ſhip.

The chief judgment of an admiral, is to form his line in a proper diſpoſition and ſtrength from the van throughout to the rear; in doing which, particular regard muſt be had to make the center ſtrong, for if that is forced, or broke through, the battle is looked upon as loſt. Here it is to be obſerved, that, in a ſea-action, the center is made the ſtrongeſt, whereas, in a land-fight, it is the weakeſt; and the wings of an army are ſtrongeſt, leſt the enemy, by forcing a wing, ſhould have the advantage of flanking, and conſequently putting the line in diſorder: for the ſame reaſon alſo, the van and rear of a fleet is not put into confuſion, becauſe care is taken to make them proportionably ſtrong to reſiſt the enemy: therefore the weakeſt part of the line will be in the quarters, ſupported each way from the center throughout.

The ſignal being made for battle, each diviſion, every captain crouds into his proper ſtation without loſs of time: they endeavour to approach each other till within point-blank gun-ſhot, which is near enough for a line of battle; for if you ſhould be too near, your line will naturally fall into a curve, notwithſtanding all your endeavours to the contrary; beſides, you cannot ſo well obſerve your own line: the enemy may intercept your ſight, eſpecially if the line be long, which may cauſe a miſtake in the ſignals. It would be better for the contending admirals in chief, that each had a view of his own line, as well as of that of the enemy, in order to make proper ſignals, and, if any diſtreſs happen, to be the better able to relieve, or if any advantage, to improve upon it.

The battle being begun, the fate of war decides the day. In a word, the ſucceſs of all depends upon placing your ſhot well, and preſerving a proper diſpoſition in the line. There is one maxim, by which we ſhould always be guided, that is, that bravery and reſolution are abſolutely neceſſary in the firſt ſort of engagement, viz. between ſingle ſhips; and conduct and bravery in the ſecond ſort, viz. that between two ſquadrons.

Conduct and preſence of mind are chiefly requiſite in a line of battle; for the admiral cannot be ſuppoſed to want bravery and reſolution. It is then he muſt ſummon up all his knowledge and experience, to judge of the ſtrength of his line; when and how to keep it as complete as poſſible, by ordering ſhips from the corps-de-reſerve, or by changing ſhips from one part of the line to the other; or by detaching from one part of the wings, which may not be ſo much preſſed, to that which is. Here he muſt alſo conſider the poſition of his enemy; his eye muſt be on him, as well as on his own line, from the van to the rear; and all ſhould ſtrictly mind the admiral's motions, ſignals, &c. Boats will, in all probability, be continually paſſing from the ſhips to their flag-officers, if any thing extraordinary ſhould happen, to acquaint them of it; and from the admirals or commanding officers of each diviſion to the admiral in chief, giving an account of the ſtate and con-

dition of each diviſion, which will be a great ſatiſfaction to him, as he will then be better able to judge how to aſſiſt where moſt wanted if occaſion, or how to improve upon any advantage gained.

The battle drawing to a concluſion, it is eaſy to judge what the conqueror will do to improve his victory; as neceſſary a part of an officer as any in the action, as it requires great judgment and readineſs of thought; and the other, in making his retreat, ſhould let ſlip no opportunity to ſave as many of his fleet as he poſſibly can. His eye muſt be quick, and his judgment and preſence of mind as ready as at the firſt onſet of the battle. He has no other reſource left but in his eſcape, and this comfortable alleviation of his defeat, that a glorious retreat may gain him as much honour as the victory did to the conqueror.

FIGURAL, FIGURATE, or FIGURATIVE, a term applied to whatever is expreſſed by obſcure reſemblances. The word is chiefly applied to the types and myſteries of the Moſaic law; as alſo to any expreſſion which is not taken in its primary and literal ſenſe.

FIGURAL, or FIGURATIVE NUMBERS, are ſuch as do or may repreſent ſome geometrical figure in relation to which they are always conſidered, as triangular numbers, pentagonal numbers, pyramidal numbers, &c.

FIGURATIVE, among grammarians, is the ſame with what is otherwiſe called characteriſtic. See CHARACTERISTIC.

FIGURATIVE COUNTERPOINT, in muſic, is that wherein there is a mixture of diſcords along with the concords. See the article COUNTERPOINT.

FIGURATIVE DESCANT, in muſic. See the article DESCANT.

FIGURE, in philoſophy, the ſurface or terminating extremities of any body.

FIGURE, in aſtrology, is applied to the deſcription, ſtate, and diſpoſition of the heavens at a certain hour, where the places of the planets and ſtars are marked in a figure of twelve triangles called houſes, with regard to the horoſcope to be drawn from it. They likewiſe call it horoſcope and celeſtial themis.

FIGURE, in conic ſections, according to Apollinus, is the rectangle of the latus rectum and tranſverſum in the hyperbola and ellipſis. De la Hire calls the rectangle of any diameter and its proper parameter, in the hyperbola and ellipſis, the figure of that diameter.

FIGURE, in dancing, denotes the ſeveral ſteps which the dancer makes in order and cadence, conſidered as they mark certain figures on the floor.

FIGURE, in fortification, the plan of any fortified place, or the interior polygon; of this there are two ſorts, regular and irregular; a regular figure is that where the ſides and angles are equal; an irregular is the contrary.

FIGURE, in geometry, the ſuperficies included between one or more lines, of which there are three ſorts, as rectilineal, curvilineal, and mixed figures: rectilineal have their extremities all right-lines, as triangles, quadrilaterals, &c. Curvilineal are ſuch as have their extremities crooked, as circles, ellipſes, &c. Mixed, are partly right-lines and partly crooked, as a ſemicircle, ſegment of a circle, &c.

FIGURES, in arithmetic, are certain characters whereby we denote any number, which may be expreſſed by any combination of the nine digits, as 1, 2, 3, 4, 5, 6, 7, 8, 9, and 0.

FIGWORT. See SCROPHULARIA.

FILAMENT, a ſmall fine fibre or thread, which compoſes the texture of the fleſh, nerves, ſkin, &c. of an animal: and it is likewiſe applied to the component parts of vegetables; as alſo to the fibres belonging to their roots. It is alſo uſed to ſignify that viſcid concreted matter, which appears like hairs or threads in urine.

The word is Latin, *filamentum*, which is a diminutive of *filum*, a thread.

FILAMENT, among botaniſts, that part of the ſtamina which ſupports the antheræ and connects it with the flowers, and is of different forms and proportions, according to what claſs the flower belongs to. See the article STAMINA.

FILAZER, or FILACER, an officer of the Common Pleas, ſo called from his filing thoſe writs whereon he makes out proceſs.

FILBERT, or FILBERD, the fruit of the corylus, or hazel. This ſpecies of nuts is more nouriſhing than the common ones; but is hard to digeſt. They are however worthy of being propagated in orchards and gardens; which is done by planting them in February.

FILE, among mechanics, a tool uſed by workmen in metal, &c. in order to ſmooth, poliſh, or cut. It is uſed, in pharmacy, to reduce hard ſubſtances to fine particles, whoſe conſiſtence will not admit of powdering.

FILE, or LABEL, in heraldry, conſiſts ſometimes of more, and ſometimes of fewer points. According to Guillim, it is borne as a charge in a coat of arms: but it is uſually the difference or mark of diſtinction which the elder brother bears in his coat during his father's life-time. Some call the file the upper horizontal line, and the label the point that iſſues from it.

FILE, in the art of war, a row of ſoldiers, ſtanding one behind another, which is the depth of the battalion or ſquadron. The files of a battalion of foot are generally three deep; as are ſometimes thoſe of a ſquadron of horſe. The files muſt be ſtraight, and parallel one to another.

FILIGRANE, or FILIGREE-WORK, any piece of gold or silver-work that is curiously done, with grains or drops on the filaments or threads.

FILING, in smithery, the operation of fashioning metalline bodies by means of a file. See FILE.

FILIPENDULA, dropwort, in botany, a genus of plants, whose characters are the following.

The root is fibrous and perennial, with glandulous bulbs fastened to it: the leaves are finely jagged, like those of millefoil: the calyx is monophyllous, denticulated, and divided into six or seven segments which are retroflected, or bent backwards: the flowers are hexapetalous or heptapetalous, loosely disposed in panicles on long stalks, which are almost naked: the stamina are numerous, and situated on the reflected margin of the calyx: the fruit is generally round, and contains many seeds compacted together, each of them furnished with its tube.

This plant contains a salt, approaching to that of alum; but it is mixed with a great deal of sulphur. All authors agree that it is very diuretic and aperitive; and is also recommended for the epilepsy and dysentery.

FILIX, in botany, an order of the cryptogamia class of plants, comprehending the fern, horse-tail, adder's tongue, maiden-hair, spleenwort, polypody, &c. See the articles FERN, HORSE-TAIL, &c.

FILLER-HORSE, one yoked immediately to a cart. See the article CART.

FILLET, in heraldry, the fourth part of the ordinary called a chief, which is placed in the chief point of the escutcheon.

FILLET, in painting, gilding, &c. is a little rule or reglet of leaf-gold, drawn over some mouldings; or on the edges of frames, &c. especially when painted white, by way of ornament.

FILLET, in anatomy, the nervous ligament under the tongue, which midwives usually divide with their nail, or a sixpence, immediately after the child's birth: it is most commonly called the frænum.

FILLET, or FILET, in architecture, a little square member, or moulding, used in divers places and on divers occasions; but generally as a crowning over a greater moulding. It is called lista or listella by the Italians: by the French, reglet; and by others, band and bandelette.

FILLET, in the menage, the loins of an horse, which begin at the place where the hinder part of the saddle rests.

FILLING *the Sails*, in the sea-language, the act of disposing a sail in such a manner, that the wind pressing into the cavity or belly of it shall force the ship forward, or a-head, in contradistinction to backing, which forces her a-stern; and shivering, which makes her remain almost in a state of rest, neither advancing nor retreating. It may appear something remarkable, but is certainly true, that a ship may be forced backward or forward, or may remain in her place, with any wind, while her stem is all the while directed to one part of the horizon; and these different states of motion or rest may be communicated by backing, filling, or shivering the sails, by drawing the braces on one side, and loosening them on the other. See the articles BRACE, BACKING, and SHIVERING.

FILLY, a term among the horse-dealers, to denote the female or mare colt. See the article FOAL.

FILM, in botany, that woody skin which separates the seeds in the pods of plants.

FILTER, or FILTRE, in chemistry, a strainer, commonly made of bibulous or filtring paper, in the form of a funnel, through which any fluid is passed, in order to separate the gross particles from it, and render it limpid. This filtre is put into a funnel, with the small end in the vessel for the reception of the filtrated liquor, and then the liquor is poured into the paper, not too much at once, for fear of bursting it. A filtre is also made of a woollen bag, called Hippocrates's sleeve, or one of linen, according to the nature of the liquor to be filtred.

FILTRATION, in chemistry. See DEPURATION.

FIMBRIÆ, denotes appendages disposed by way of fringe round the border of any thing: such are those about the thicker extremities of the Fallopian tubes. See GENERATION.

FIMBRIATED, in heraldry, an ordinary with a narrow border or hem of another tincture.

This, in Latin, is called *fimbriatus*; that is, edged or fringed.

FIN, *Pinna*, in natural history, a well known part of fishes, consisting of a membrane supported by rays, or little bony or cartilaginous officles.

FINANCES, in the French polity, signify the revenues of the king and state.

FINE, in law, hath divers applications: sometimes it is used for a formal conveyance of lands or tenements, or of any thing inheritable, being *in esse tempore finis*, in order to cut off all controversies. Others define it to be a final agreement between persons, concerning any lands or rents, &c. of which any suit or writ is depending between them in any court.

FINE sometimes signifies a sum of money paid for entering lands or tenements lett by lease; and sometimes a pecuniary mulct for an offence committed against the king and his laws, or against the lord of the manor.

FINE *adnullando levato de tenemento quod fuit de antiquo dominico*, is a writ to the justices for disannulling a fine levied of lands holden in ancient demesne to the prejudice of the lord.

FINE *capiendo pro terris*, &c. a writ lying for one that, upon conviction by a jury, having his lands and goods taken into the king's hands, and his body committed to prison, obtains favour for a sum of money,

money, &c. to be remitted his impriſonment, and his lands and goods to be redelivered to him.

FINE *Force*, an abſolute neceſſity that is unavoidable, whereby one is compelled to do any thing.

FINE *levando de tenementis tentis de rege in capite*, *&c.* a writ directed to the juſtices of the Common-Pleas, to licenſe them to admit of a fine for ſale of lands holden in capite.

FINE *non capiendo pro pulchre placitando*, a writ to inhibit officers of courts to take fines for fair pleading.

FINE *pro rediſſeiſina capienda*, *&c.* a writ that lies for the releaſe of one laid in priſon for a reſeiſin, upon a reaſonable fine.

FINE *for alienation*, a reaſonable fine paid the king by his tenants in chief, for licence to alienate their lands.

FINERS *of Gold and Silver*, are thoſe who ſeparate theſe metals from coarſer ores. See the article REFINERS.

FINERY, in the iron-works, one of the forges at which the iron is hammered and faſhioned into what they call a bloom, or ſquare bar. See the article Iron.

FINE-STILLER, in the diſtillery, that branch of the art which is employed on the diſtilling the ſpirit from treacle or other preparations or recrements of ſugar, is called fine-ſtilling, by way of diſtinction from malt-ſtilling; and the perſon who exerciſes this part of the trade is called a fine-ſtiller.

The operation in procuring the ſpirit from ſugar is the ſame with that uſed in making the malt ſpirit; a waſh of the ſaccharine matter being made with water from treacle, &c. and fermented with yeaſt. It is uſual to add, in this caſe, however, a conſiderable quantity of malt, and ſometimes powdered jalap, to the fermenting backs. The malt accelerates the fermentation, and makes the ſpirit come out the cheaper; and jalap prevents any muſty head on the ſurface of the fermenting liquor, ſo as to leave a greater opportunity for the free acceſs of the air, and thus to ſhorten the work, by turning the foamy into a hiſſing fermentation. *Shaw's Lect.*

FINGERS, in anatomy. See HAND.

FINING *of Wines*. See WINE.

FINISHING, in architecture, is frequently uſed for a crowning, acroter, &c. raiſed over a piece of building, to terminate, complete, or finiſh it. See the article CROWNING.

FINITE, ſomething bounded or limited, in contradiſtinction to infinite. See the article INFINITE.

FINITOR, in aſtronomy, the ſame with horizon, ſo called becauſe it terminates the ſight or proſpect. See HORIZON.

FINNIKIN, the Engliſh name of a ſpecies of pigeon, remarkable for its wheeling round ſeveral times, whenever it courts the female.

FIRE, a general name, by which men ſeem to underſtand a certain ſenſation, or complex notion, of light, heat, burning, melting, &c.

The power of fire is ſo great, its effects ſo extenſive, and the manner of its acting ſo wonderful, that ſome of the wiſeſt nations of old, reverenced and worſhipped it as the ſupreme deity. Some of the chemiſts alſo, after they had diſcovered its ſurpriſing operations, ſuſpected it to be an uncreated being: and, indeed, the moſt famous of them have acknowledged it as the ſource of all their knowledge; and hence have profeſſed themſelves philoſophers by fire, nor thought they could be honoured with a nobler title. Now, amongſt all the wonderful properties of fire, there is none more extraordinary than this, that though it is the principal cauſe of almoſt all the ſenſible effects that continually fall under our obſervation, yet it is itſelf of ſo infinitely a ſubtile nature, that it illudes the moſt ſagacious enquiries, nor ever comes within the cognizance of our ſenſes; and hence others have been led to be of opinion, that it ought to be looked upon as ſpirit rather than body. Fire is generally divided into three kinds or ſpecies, viz. celeſtial, ſubterraneous, and culinary.

By celeſtial fire is principally underſtood that of the ſun, without regard to that of the fixed ſtars, though this, perhaps, may be of the ſame nature.

By ſubterraneous fire we underſtand that which manifeſts itſelf in fiery eruptions of the earth, volcanoes, or burning mountains; or by any other effects it produces in mines, or the more central parts of the earth.

By culinary fire we mean that employed in all chemical operations, and the common occaſions of life.

The ſun's heat appears to be the actuating principle, or general inſtrument of all the operations in the animal, vegetable, atmoſpherical, marine, and mineral kingdoms.

Fire, conſidered in itſelf, ſeems to exiſt, in the greateſt purity and perfection in the celeſtial regions; at leaſt, we are inſenſible of any conſiderable ſmoke it yields: for the rays of light come to us from the ſun, unmixed with any of that groſs, feculent, or terreſtrial matter, found in culinary and ſubterranean fires: but, allowing for this difference, the effects of the ſolar fire appear the ſame as thoſe of culinary fire.

If we examine the effects of ſubterraneous fires, we ſhall find them the ſame with thoſe produced by culinary fire. Thus burnt coals, cinders, and melted minerals, are thrown up by Veſuvius and other burning mountains. Warm nephritical exhalations, natural hot ſprings, ſteams, vapours, ſmoke, &c. are found in ſeveral parts of the globe, riſing nearly in the ſame manner as if they were produced by the heat

heat of a furnace. Whence it appears, that ſubterraneous fires are of the ſame nature with the culinary.

All the phyſical knowledge we can have of a ſubject, muſt ariſe from attending to its properties and effects: but theſe properties and effects can never be diſcovered without the help of experiments; which, in philoſophical enquiries, are the only interpreters betwixt the ſenſes and the reaſon: whence all thoſe notions of fire ſhould be rejected as precarious and unſound, that are taken from the direct teſtimony of the ſenſes, or the naked reaſon unaſſiſted by experiments. In this enquiry, therefore, the mind ſhould particularly be kept unpreposſeſſed, and, before it pronounces, wait for full information. As men generally affix to the word fire, a complex idea of burning, light, heat, melting, &c. this idea ſhould be analyſed, in order to ſee what parts are eſſential, and what precarious or arbitrary.

We frequently find the effects of fire produced, where no viſible fire appeared. Thus the fingers are eaſily burnt by an iron heated below the degree of ignition, or ſo as to be no ways viſibly red-hot or fiery: whence it follows, that the eye is no judge of fire.

So likewiſe the touch gives us no poſitive notice of any degree of fire below the natural heat of the body, or any ſo great as to deſtroy the organ.

Again, the effects of fire are often produced without any manifeſt ſigns of burning, melting, &c. as in evaporations, &c. If this method of excluſion and rejection were purſued to its due length, we ſhould, perhaps, find no criterion, infallible mark, or characteriſtic of fire in general, but that of a particular motion ſtruggling among the minute parts of bodies, and tending to throw them off at the ſurface. If this ſhould prove the caſe, then ſuch a motion will be the form and eſſence of fire, and which, being preſent, makes fire alſo preſent; and, when abſent, makes fire alſo abſent: whence to produce, and produce this motion in bodies, will be one and the ſame thing. See ELECTRICITY.

The great and fundamental difference in reſpect to the nature of fire is, whether it be originally ſuch, formed thus by the Creator himſelf at the beginning of things, or whether it be mechanically producible from other bodies, by inducing ſome alterations in the particles thereof. The former opinion is maintained by Homberg, Boerhaave, the younger Lemery, and s'Graveſande; the latter is chiefly ſupported by the Engliſh philoſophers, lord Bacon, Mr. Boyle, and Sir Iſaac Newton.

Bacon, in the treatiſe De Forma Calicli, deduces, from a great number of particulars, that heat in bodies is no other than motion, ſo and ſo circumſtanced; ſo that, to produce heat in a body, nothing is required but to excite a certain motion in the parts thereof.

Boyle ſeconds him in an expreſs treatiſe of the mechanical organ of heat and cold, and maintains the ſame doctrine with new obſervations and experiments; as a ſpecimen of which we ſhall here give the two following:

1. In the production of heat, ſays that able philoſopher, there appears nothing on the part either of the agent or patient, but motion and its natural effects. When a ſmith briſkly hammers a piece of iron, the metal thereby becomes exceedingly hot; yet there is nothing to make it ſo, except the forcible motion of the hammer impreſſing a vehement and variouſly determined agitation on the ſmall parts of the iron, which, being a cold body before, grows, by that ſuper-induced commotion of its ſmall parts, hot: firſt, in a more looſe acceptation of the word, with regard to ſome other bodies, compared with which it was cold before; then ſenſibly hot, becauſe this agitation ſurpaſſes that of the points of our fingers; and in this inſtance oftentimes the hammer and anvil continue cold after the operation; which ſhews that the heat acquired by the iron was not communicated by either of thoſe implements, as heat; but produced in it by a motion, great enough ſtrongly to agitate the parts of ſo ſmall a body as the piece of iron, without being able to have the like effect upon ſo much greater maſſes of metal as the hammer and the anvil: though, if the percuſſions were often and briſkly renewed, and the hammer were ſmall, this alſo might be heated: whence it is not neceſſary that a body itſelf be hot to give heat.

2. If a large nail be driven by a hammer into a plank of wood, it will receive ſeveral ſtrokes on its head before it grows hot; but when it is once driven to the head, a few ſtrokes ſuffice to give it a conſiderable heat; for while, at every blow of the hammer, the nail enters farther into the wood, the motion produced is chiefly progreſſive, and is of the whole nail tending one way; but when that motion ceaſes, the impulſe given by the ſtroke being unable to drive the nail farther on, or break it, muſt be ſpent in making a various, vehement, and inteſtine commotion of the parts among themſelves, wherein the nature of heat conſiſts.

Agreeable to this, is the opinion of Sir Iſaac Newton; who conceives, that groſs bodies may be converted into light, by the agitation of their particles: and light, again, into groſs bodies, by being fixed therein.

On the other hand, M. Homberg, in his Eſſai du Souffre Principe, holds, that the chemical principle, or element ſulphur, which is ſuppoſed one of the ſimple, primary, pre-exiſtent ingredients of all natural bodies, is real fire, and conſequently that fire is coeval with bodies.

Dr. s'Graveſande goes on much the ſame principle: fire, according to him, enters the compoſition of all bodies, is contained in all bodies, and may be ſeparated or procured from all bodies, by rubbing them againſt each other; and thus putting their fire

in motion: but fire, he adds, is by no means generated by such motion.

Mr. Lemery, the younger, agrees with these two authors in asserting this absolute and ingenerable nature of fire: but he extends it farther. Not contented to confine it as an element to bodies, he endeavours to shew, that it is equally diffused through all space, and that it is present in all places; in the void spaces between bodies, as well as in the insensible interstices between their parts.

This last sentiment falls in with that of Boerhaave, and the celebrated M. Musschenbroek. But notwithstanding what those able philosophers have advanced, it is evident that fire, heat, flame, &c. are only the different modifications of the particles of light, and that the particles of light themselves depend entirely on velocity for their lucific quality; since, by many experiments, we know, that the particles of bodies become lucid, or particles of light, by only producing in them a requisite degree of velocity: thus the particles in a rod of iron, being hammered very nimbly, shine and become red-hot; thus also the violent stroke of the flint against the steel, in striking fire, puts the particles of the steel, which it takes off, into such a motion as causes them to melt and become red-hot, which makes the sparks of fire produced by each stroke: as, therefore, fire consists in the great velocity of the particles, so it may be communicated from one body in which it is, to another in which it is not, after the same manner that one body in motion will communicate motion to another that has got none.

Fire differs from heat only in this, that heat is a motion in the particles of a body, with a lesser degree of velocity; and fire a motion with a greater degree of velocity, viz. such as is sufficient to make the particles shine; though we often call such a state as will burn, fire, though it does not actually shine; and we seldom call those lucid bodies fires, which only shine, and do not burn. These are a sort of phosphori, which, though they have no heat, yet seem to owe their lucidity to the motion of their parts. See the articles HEAT and PHOSPHORUS.

There seems to be no other difference between fire and flame, than this, that fire consists in a glowing degree of velocity in the parts of a body, while yet subsisting together in the mass; but flame is the same degree of velocity in the particles dissipated and flying off in vapour: or, to use Sir Isaac Newton's expression, flame is nothing else but a red-hot vapour. See the article FLAME.

FIRE, in chemistry, the great instrument by which most of the operations in that art are performed.

The kind, degree, direction, &c. of fire, are things the chemist is principally to attend to. There are, in chemistry, as many kinds of fire as there are mediums through which it may be conveyed, or fuels that afford it. For common use, fire is conveyed through ashes, sand, water, &c. or directly through the containing vessel. Hence, fires are denominated of various kinds, as those of sand, filings of iron, and ashes, the reverberatory fire, the ignis rotæ, or fire for fusion, the lamp fire, the balneum mariæ, the vapour bath, and the fire of suppression. The chemists use also several other kinds of heats, which may be classed among the fires, such as insolation, a bath of horse-dung, a bath of the skins of grapes, and the heat of quick-lime.

For the balneum arenosum, or the fires or baths of sand, filings of iron, and ashes, balneum mariæ, balneum vaporis, or vapour-bath, see BALNEUM.

The reverberatory fire is made in a furnace covered with a dome, that by this means the heat or flame, which has always a tendency to make its escape at the superior parts of the furnace, may be reverberated, or beat back on the vessel immediately exposed to it. To expose a vessel to a naked fire, or to distil with a naked fire, is when there is no intermediate substance between the distilling vessel and the fire.

The ignis rotæ, or fire for fusion, is when a crucible or any other vessel containing the matter destined for fusion, is surrounded with live-coals.

Lamp fire is when any matter contained in a glass vessel is rendered hot by the equable heat of a lighted lamp.

Fire of suppression is when, in order to distil per descensum, the fire is laid above the matter, so that the moisture forced from it, by means of the heat, is precipitated to the bottom of the vessel; or when the body of the retort, or other vessel, is covered over with fire.

Insolation is when any matter designed either to be put into fermentation or dried, is exposed to the heat of the sun.

The bath of horse-dung, called also the horse's belly, is when a vessel, containing any matter to be either digested or distilled, is placed in a large heap of horse-dung.

Bath of the skins of grapes, like the bath of horse-dung, serves for digestions or distillations; the skins are to be collected after the vintage.

The heat of quick-lime moistened, may serve for some distillations.

Some differences may be found in the effects produced by these different fires, applied in the same degree: but they have not, perhaps, been noted as they deserve. In several bodies it is evident, that dry and moist heats have different effects, which we may find remarkably in the common culinary operations of boiling, roasting, baking, &c. and hence, when the same effects are required perfectly similar, the same kinds, as well as degrees, of fire are to be used.

The purest fire is that of alcohol, or perfectly pure spirit of wine; the next in purity is that of distilled

diſtilled oils; the next, that of charcoal, or charred turf; and the impureſt, pit coal: but all theſe have nearly the ſame effect, when received through the ſame kind of medium.

Degrees of FIRE.—The laſt thing to be conſidered is, how to regulate and aſcertain the degrees of fire in chemical operations, ſo as to produce the effects required in every caſe. The common directions of chemiſts about this matter are full of uncertainty; the firſt, ſecond, third, and fourth degrees of heat, or fire, meaning no preciſe degrees, meaſured by any ſtandard: however, according to Boerhaave, they are as follow:

The firſt degree of fire is that by which nature performs the office of vegetation in plants, and whereby chemiſtry imitates or does the like: this commences from the higheſt degree of cold, which, in Fahrenheit's thermometer, is denoted by one, and ends at eighty degrees; ſince in this whole interval we find certain plants give indications of life and growth. This heat is ſuited to extracting of the native ſpirits of odoriferous vegetables with oils, as that of roſes, jeſſamin, &c. and again, to making the more curious inſolations, &c.

The ſecond degree of fire may be accounted that of the human body, in a healthy ſtate. This degree is always greater than that of the ambient air, and may be ſuppoſed to commence at the 40th degree of the thermometer, and end about the 94th. Within this compaſs animals may live and ſubſiſt, that is, if their juices be of any degree of heat within theſe bounds. This degree is adapted to vinous and acetous fermentation, putrefaction, excluſion of the chick, the finer digeſtions, the making of tinctures and elixirs; and the adepts have uſed it for the firſt digeſtion of their mercury, by carrying the including veſſel conſtantly in their pocket.

The third degree of fire is that which extends from 94 degrees of the thermometer to 212, at which laſt water uſually boils. This degree is required in the diſtillation of ſimple and compound waters, the eſſential oils of vegetables, and will coagulate or conſolidate the ſerum, blood, and other animal juices, and conſequently deſtroy the creatures.

The fourth degree may be taken from 211 to 600 of the thermometer, within which latitude quickſilver or oil of vitriol boils, diſtils, or becomes volatile. This degree is ſuited to the melting of lead, tin, biſmuth, &c. and the ſubliming of ſal armoniac and ſulphur, the calcining of antimony, &c.

The fifth degree is that wherein the other metals melt, and which commences from 600 degrees of the thermometer, and ends where iron is held in a ſtate of fuſion. In this degree moſt bodies are deſtroyed; but glaſs, gold, ſilver, copper, and iron, remain long unchanged; all other fixed bodies grow red-hot in this degree, and all the unvitrifiable ſtones are calcined.

The ſixth and higheſt degree of fire, hitherto known, is that of the burning lens, or concave, by M. Villette, Tſchirnhauſen, Buffon, and others. Thr focus of theſe lenſes will even volatilize what is called the metalline or murcurial part of gold, and vitrify the more terreſtrial. See the article BURNING-GLASS.

The fires of ſand, filings of iron, and aſhes, have generally their degrees from the firſt to the third: the reverberatory fire has its degrees from the firſt to the fourth: the ignis rotæ ſerves for calcinations and fuſions; and a veſſel may receive different degrees of heat from a lighted lamp: the balneum mariæ and balneum vaporis have alſo their degrees: as has the fire of ſuppreſſion its degrees: inſolation has its degrees in proportion to the heat of the ſun, to which the ſubſtances are expoſed: the bath of horſe-dung has its degrees according to the bulk of the heap, or the place in which it is lodged: the bath of grape-ſkins has alſo its degrees like that of the bath of horſe-dung: and the heat of quick-lime has alſo its degrees; for accordlng as we deſire it more or leſs ſtrong, we expoſe it to powder longer or ſhorter in the open air; and when we have occaſion for all its heat, we uſe it as quick as we poſſibly can.

FIRE, in medicine. See CAUSTIC.

FIRE, in ſurgery. See CAUTERY.

St. Anthony's FIRE, in medicine. See the article ERYSIPELAS.

Walking FIRE, in meteorology. See WILL-WITH-A-WAISP.

FIRE, in theology. See the articles HELL, CONFLAGRATION, &c.

FIRE, in the art of war, a word of command to the ſoldiers, to diſcharge their muſquets; to the cavalry, to diſcharge their carbines or piſtols; to the grenadiers, to fire their grenadoes; and to the gunners, to fire the guns.

Running FIRE is when a rank of men, drawn up, fire one after another; or, when the lines of an army are drawn out to fire on account of a victory, each ſquadron or battalion takes it from another, from the right of the firſt line to the left, and from the left to the right of the ſecond line.

FIRE-ARMS are all ſorts of arms charged with powder and ball, as cannon, muſquets, carbines, piſtols, blunderbuſſes, &c. See the articles CANNON, GUN, &c.

FIRE-ARROWS, certain deſtructive inſtruments uſed by privateers to ſet fire to the ſails of the enemy: they are ſhot from a muſketoon or ſwivel-gun; and being furniſhed with ſprings to prevent their going entirely through the ſails, a match, being previouſly dipt in ſulphur and nitre, is wound about the ſhaft of the arrow, which is iron, and this immediately catches fire, as ſoon after the exploſion.

FIRE-BALL, in the art of war, a compoſition of meal-powder, ſulphur, ſalt-petre, pitch, &c. about the

the bigneſs of a hand-grenade, coated over with flax, and primed with a ſlow compoſition of a fuſee. This is to be thrown into the enemy's works in the night-time, to diſcover where they are; or to fire houſes, galleries, or blinds of the beſiegers; but they are then armed with ſpikes or hooks of iron, that they may not roll off, but ſtick or hang where they are deſigned to have any effect.

FIRE-BARE, in our old cuſtoms, ſignifies a beacon, or tower, by the ſea-ſide, wherein there were kept continual lights.

FIRE BOTE is fuel or firing for neceſſary uſe, allowed to tenants, out of the lands granted to them.

FIRE-ENGINE. See the article ENGINE.

FIRE-LOCK. See GUN, MUSQUET, &c.

FIRE-MASTER, in our train of artillery, an officer who gives the directions and proportions of ingredients for each compoſition required in fire-works, whether for the ſervice of war, or for rejoicings and recreations.

His orders are given to the fire-workers and bombardiers, who muſt execute them.

FIRE-POTS, in the military art, ſmall earthen pots, into which is put a charged grenade, and over that powder enough till the grenade is covered, then the pot is covered with a piece of parchment, and two pieces of match acroſs, lighted: this pot being thrown where it is deſigned, it breaks and fires the powder, and burns all that is near it, and likewiſe fires the powder in the grenade, which ought to have no fuſe, to the end its operations may be the quicker.

FIRE-SHIPS, in the marine, certain old ſhips attendant on a fleet, to deſtroy any of the enemy's ſhips.

They are provided with a train, which is conſtantly laid ready for execution, and runs round the ſhip's lower deck ſpirally from one end to the other; they have alſo grappling-irons at their yard-arms, to hook the enemy's rigging, &c. When they are firmly grappled, the boat is drawn up to the ſhip on the oppoſite ſide to the enemy, and fire is ſet to the train, the captain being the laſt man who leaves the ſhip on this occaſion, which is a very dangerous enterprize. See that part of the article *Sea* FIGHT, which treats of the ancient marine war.

FIRE-WORKERS, officers ſubordinate to the fire-maſter.

FIRE-WORKS. See PYROTECHNIA.

Wild FIRE, a kind of artificial or factitious fire, which burns even under water, and that with greater violence than out of it. It is compoſed of ſulphur, napththa, pitch, gum, and bitumen; and is only extinguiſhable by vinegar mixed with ſand and urine, or by covering it with raw hides. Its motion or tendency is ſaid to be contrary to that of natural fire, and it always follows the direction in which it is thrown, whether it be downwards, ſideways, or otherwiſe.

Several are of opinion that the ancient Greeks and Romans uſed this fire in their engagements at ſea: whether or not that was the caſe, it was applied againſt the Saracens in a ſea-fight, commanded by Conſtantine Pogonates, in the Heleſpont, and with ſuch effect that he burnt the whole fleet therewith, wherein were thirty thouſand men.

Electrical FIRE. See ELECTRICITY.

FIRING-IRON, in farriery, an inſtrument not unlike the blade of a knife; which being made red-hot, is applied to a horſe's hams, or other places ſtanding in need of it, as in preternatural ſwellings, farcy knots, &c. in order to diſcuſs them. Sometimes this is done for wrenches of the paſterns.

FIRKIN, an Engliſh meaſure of capacity, for things liquid, being the fourth part of the barrel: it contains eight gallons of ale, ſoap, or herrings; and nine gallons of beer. See MEASURE and BARREL.

FIRLOT, a dry meaſure uſed in Scotland. The oat-firlot contains $21\frac{1}{4}$ pints of that country; the wheat-firlot contains about 2211 cubical inches; and the barley-firlot 31 ſtandard pints, Hence it appears that the Scotch wheat-firlot exceeds the Engliſh buſhel by 33 cubical inches. See the article MEASURE.

FIRMAMENT, in the old aſtronomy, the eighth ſphere, or heaven, with regard to thoſe of the ſeven planets which it ſurrounds. Beſides the diurnal motion, according to Ptolemy, given it by the primum mobile, from eaſt to weſt round the poles of the equator, it has an oppoſite motion to this, from weſt to eaſt upon the poles of the ecliptic, called the ſecondary motion: by this the fixed ſtars advance, according to the order of the ſigns, about one degree in 70 or 72 years. More properly, the firmament is that ſpace expanded above us in the heavens.

The word is Latin, *firmamentum*, and derived from *firmus*, ſure, or ſtedfaſt.

FIRMAN is a paſſport or permit granted by the Great Mogul to foreign veſſels, to trade within the territories of his juriſdiction.

FIRMNESS, *Firmitas*, denotes the conſiſtence of a body, or that ſtate wherein its ſenſible parts co-here in ſuch a manner, that the motion of one part induces a motion of the reſt.

FIRST-FRUITS, *Primitiæ*, among the Hebrews, were oblations of part of the fruit of the harveſt, offered to God as an acknowledgment of his ſovereign dominion.

FIRST-FRUITS, in the church of England, are the profits of every ſpiritual benefice for the firſt year, according to the valuation thereof in the king's books. See the article ANNATES.

FIR-TREE, *Abies*, in botany, a genus of ever-green trees, whoſe leaves are ſingle, and ſet the moſt

moſt part produced on every ſide of the branches; the male flowers or catkins are placed at remote diſtances from the fruit on the ſame tree; the ſeeds are produced in cones, which are ſquamoſe.

The difference between theſe and the pines is, the latter having two or more leaves produced out of the ſheath or cover.

Theſe trees are all raiſed from ſeeds taken out of their polyſpermous cones. The way to get out the ſeeds is, either by expoſing the cones to a gentle fire, or by ſoaking them all night in water, which will cauſe their ſquamoſe cells to open, and readily emit their ſeeds. The former method is the beſt, provided they are not expoſed to too great heat. But this ought not to be done until you are ready to ſow them; which is beſt performed in the beginning of March.

Theſe plants ſhould be all raiſed in the nurſery, where they may be protected from the birds; otherwiſe they will be in danger of being deſtroyed, when they firſt come up: for as they bring up the huſk of the ſeed on the top of the plant, the birds in picking off the huſk will break off the plant, whereby a whole bed may be loſt in a few hours, if they are not carefully guarded from them.

The beſt time of ſowing theſe ſeeds is about the latter end of March, or the beginning of April, on a bed of light earth, covering the ſeeds about half an inch deep with the ſame ſort of earth. In this bed the plants ſhould remain until the following ſpring, when there ſhould be a number of beds prepared in the nurſery to receive theſe ſeedling plants; and the beginning of April they ſhould be tranſplanted into the beds, at the diſtance of ſix inches row from row, and at three inches aſunder in the rows. If the ſeaſon ſhould prove dry, it will be proper to water the plants every week once or twice, according to the warmth of the weather; and the beds ſhould be covered with mats, to ſcreen the plants from the ſun, and drying winds, until they have taken good root; after which time they will require no farther care, but to keep them clear from weeds. In theſe beds the plants may remain two years; at the end of which they ſhould be tranſplanted into an open ſpot of ground; for their roots will in that time meet quite over the beds.

The diſtance which theſe plants ſhould be placed in this nurſery, ſhould be four feet, row from row, and two feet aſunder in the rows.

When the plants are planted, if the ſeaſon ſhould prove dry, they ſhould be watered, to ſettle the earth to their roots; and if this is repeated three or four times, if the ſeaſon ſhould continue dry, it will greatly promote their taking new root, and ſecure them from the injuries of the drying winds. In this nurſery the plants may remain two or three years, according to the growth they ſhall have made; and, during this time, the ground between the plants ſhould be conſtantly kept clean from weeds, and dug between the rows every ſpring; in doing of which, care muſt be taken not to cut or injure the roots of the plants: this is all the culture they will require during their continuance in the nurſery: and, when they are tranſplanted into the places where they are to remain, the neceſſary care to be taken is, in taking them up, not to injure or cut off the roots, and let them be as little time out of the ground as poſſible; and, when they are out, to guard their roots from the drying winds. The ſureſt time for removing of theſe trees is about the beginning of April; though they may, and often are removed with ſucceſs at Michaelmas, yet the ſpring is the more ſure ſeaſon, eſpecially in moiſt land.

Moſt of the kinds of firs may be removed at the height of ſix or ſeven feet; but thoſe of two feet high are much better, and will in a years get the better of thoſe taller trees. *Miller's Gard. Dict.*

FISC, *Fiſcus*, in the civil law, the treaſury of a prince.

FISCAL, in the civil law, ſomething relating to the pecuniary intereſt of the prince or people.

FISH, in natural hiſtory, an animal which lives in the water, that being its natural element.

Willoughby, after Ariſtotle, has accurately diſtinguiſhed fiſhes into *cetaceous*, *cartilaginous*, and *ſpinous*.

The *cetaceous*, called alſo *belluæ marinæ*, have lungs, and breathe like quadrupeds: they copulate alſo like them, and conceive and bring forth their young alive, which they afterwards ſuckle with their milk.

The *cartilaginous* ſort are thoſe produced from eggs like large birds; which are alſo excluded the womb like thoſe of birds.

The *ſpinous* kind are alſo oviparous; but their eggs are ſmaller, and they have ſpinæ up and down in their fleſh to ſtrengthen them.

The ſame author is likewiſe of opinion that it would be alſo proper to divide fiſhes into ſuch as breathe with lungs, and ſuch as breathe with gills; and then to ſubdivide thoſe that breathe with gills into vivaparous and oviparous.

Naturaliſts remark that the ſtructure of fiſhes, and their confirmation to the element they reſide in, is very wonderful. Their bodies are cloathed and guarded in the beſt manner, with ſcales or ſhells, ſuitable to their reſpective circumſtances, the danger they are expoſed to, and the motion and buſineſs they are to perform. The center of gravity is placed in the propereſt part of the body for ſwimming; and their ſhape the beſt adapted to their making their way through the water, and moſt conformable to the rules of geometry. They have ſeveral parts peculiar to themſelves; as fins to balance and keep them upright, and an air-bladder to enable them to riſe and ſink at pleaſure. They have gills or branchiæ, whereby to reſpire, as animals do by their

lungs. The tail is the inſtrument of progreſſive motion, and ſerves to row them forward. Their eyes are peculiarly formed to enable them to correſpond with all the conveniencies and divergencies of rays, which the variations of the watery medium, and refractions thereof, may occaſion; in which reſpect they bear a near reſemblance to birds.

FISH, among ſeamen, a machine for drawing up the flooks of the ancher to the davit. See the article DAVIT.

It is compoſed of four parts, viz. the hook, the pendant, the block, and the tackle.

The pendant is a piece of ſtrong rope paſſing through the block, hung over the end of the davit, which projects out from the forecaſtle to keep the anchor at a diſtance from the ſhip's ſide, that the flooks may not tear it as they are drawn up: at one end of the pendant is faſtened the hook, which is of ſufficient ſtrength and capacity to grapple the flooks under water, and ſuſtain their weight: at the other end of the pendant is fixed the tackle, which is a complication of pullies, to perform this operation.

FISHES *of the Maſt*, certain pieces of wood hollowed on one ſide, and convex on the other, faſtened ſecurely on the maſts of a ſhip to ſtrengthen them, either when it is apprehended there is a neceſſity for this additional ſupport to bear an extraordinary preſſure of ſail; or after they may have ſuſtained ſome damage from a former occaſion.

FISH-PONDS, thoſe made for the breeding or feeding of fiſh.

FISHERY, a place where great numbers of fiſh are caught.

The principal fiſheries for ſalmon, herring, mackrel, pilchards, &c. are along the coaſts of England, Scotland, and Ireland; for cod, on the banks of Newfoundland; for whales, about Greenland; and for pearls, in the Eaſt and Weſt Indies.

FISHERY denotes alſo the commerce of fiſh, more particularly the catching them for ſale.

FISSURE, *Fiſſura*, a chap or crack, in ſurgery, is either natural or morbid: thus, the mouth, &c. is frequently called a natural fiſſure: morbid fiſſures are either thoſe of the cranium or other bones, or chaps of the ſkin, which ſometimes happen about the lips, anus, and other parts of the body.

The word is Latin, *fiſſura*, and derived from *findo*, to ſplit or cleave.

FISSURE, in philoſophy, is frequently applied to thoſe diviſions that are to be met with between layers of different kinds of earth or ſtone.

FISTULA, in ſurgery, a deep, narrow, and callous ulcer, generally ariſing from abſceſſes or ulcers.

The word is Latin, and literally ſignifies a pipe; this diſorder being ſo called from its reſemblance to a pipe or reed.

FISTULA *in Ano*, in ſurgery, an abſceſs running upon or into the inteſtinum rectum; though an abſceſs in this part, when once ruptured, does generally, if neglected, grow callous in its cavity and edges, and becomes, at laſt, what is properly called a fiſtula.

FISTULA LACHRYMALIS, a diſeaſe which attacks the great caruncle in the inward corner of the eye. See the article EYE.

FISTULAR, or FISTULOUS, appellations given by ſurgeons to wounds and ulcers, which degenerate into fiſtulas.

FISTULAR, among botaniſts, is applied to leaves and flowers that are tubular, or reſemble a hollow pipe.

FIT, in medicine, denotes much the ſame with paroxyſm. See PAROXYSM.

FITS *of eaſy Reflection and Tranſmiſſion*, in optics. See the articles REFLECTION and TRANSMISSION.

FITCHEE, in heraldry, a term applied to a croſs, when the lower end of it is ſharpened into a point.

FITTING-OUT, in the ſea-language, the act of providing a ſhip with a ſufficient number of men to navigate her; alſo with proviſions of all ſorts, artillery, ammunition, maſts, yards, ſails, cordage, anchors, and other furniture: alſo the rigging and ſecuring her maſts againſt the dangers of the wind and ſea.

FIXATION, in chemiſtry, the rendering any volatile ſubſtance fixed, ſo as not to fly off upon being expoſed to a great heat; hence,

FIXED BODIES are thoſe which bear a conſiderable degree of heat without evaporating, or loſing any of their weight.

FLACCIDITY, among phyſicians, a diſorder of the ſolids, cured by aſtringent and cardiac medicines, joined with exerciſe and good air.

FLAG, in the ſea language, the banners or colours by which an admiral is diſtinguiſhed at ſea.

FLAGS *in the Britiſh Navy*, are either red, white, or blue; and they are hoiſted either at the heads of the main-maſt, fore-maſt, or mizen-maſt.

Flags, when diſplayed from the top of the main-maſt, are the diſtinguiſhing marks of admirals; when from the fore-maſt of vice-admirals; and when from the mizen-maſt, of rear-admirals.

The higheſt flag in the Britiſh navy is the anchor and rope, which is only diſplayed when the lord-high admiral, or lords commiſſioners of the admiralty are on board; the next is the union, the diſtinction peculiar to the ſecond officer, called admiral of the fleet; and the loweſt flag is the blue at the mizen-maſt.

FLAGELLANTES, WHIPPERS, in church hiſtory, certain enthuſiaſts in the thirteenth century, who maintained that there was no remiſſion of ſins without flagellation, or whipping. Accordingly

ingly they walked in proceſſion, preceded by prieſts carrying the croſs, and publicly laſhed themſelves, till the blood dropped from their naked backs.

FLAGEOLET, or FLAJEOLET, a little flute, uſed chiefly by ſhepherds and country people. It is made of box, or other hard wood, and ſometimes of ivory, and has ſix holes beſides that at the bottom, the mouth-piece, and that behind the neck. See FLUTE.

FLAIL, an inſtrument for threſhing corn. See CORN and THRESHING.

FLAKE, among gardeners, a kind of ſtriped carnations, with only two colours.

FLAMBEAU, a kind of large taper, made of hempen wicks, by pouring melted wax on their top, and letting it run down to the bottom. This done, they lay them to dry; after which they roll them on a table, and join four of them together by means of red-hot iron; and then pour on more wax, till the flambeau is brought to the ſize required.

FLAME, *Flamma*, in phyſiology, the ſmall parts of an inflammable or conſiderably unctuous body, that are ſet on fire, or briſkly agitated and thrown off, with a certain vibrative motion at the ſurface of that body into the open air: or, in Sir Iſaac Newton's words, the flame of a body is only the ſmoke thereof heated red-hot; and the ſmoke is only the volatile part of the body ſeparated by the fire. See FIRE and SMOKE.

FLAMEN, in Roman antiquity, the name of an order of prieſts, inſtituted by Romulus or Numa; authors not being agreed on this head.

FLANCH, FLANQUE, or FLASQUE, in heraldry, an ordinary always borne double, being the ſegment of a circular ſuperficies.

FLANNEL, or FLANEL, a looſe ſort of woollen ſtuff not croſſed, and wove on a loom with two treddles, like bays.

FLANK, in the menage, the ſide of a horſe between the ribs and haunches.

FLANKS *of an Army*, are the troops encamped on the right and left, as the flanks of a battalion are the files on the right and left.

FLANK *of a Baſtion*, in fortification, that part which joins the face to the curtain. See the article BASTION.

Oblique FLANK, or *Second* FLANK, that part of the curtain from whence the face of the oppoſite baſtion may be diſcovered.

Retired FLANK, or *Low* FLANK, or *Covered* FLANK, one of the platforms of the cazemate. See the article CAZEMATE.

Theſe retired flanks are a great defence to the oppoſite baſtion, and the paſſage of the moat, becauſe the beſiegers cannot ſee nor eaſily diſmount their guns. The curtain is eſteemed the ſtrongeſt part of the fortification, becauſe flanked at both ends; and the face is accounted the weakeſt, as having only one defence from the oppoſite flank.

FLANKED ANGLE, in fortification, that formed by the two faces of a baſtion.

FLANKING ANGLE, or *Angle of the* TENAILLE, that compoſed of the two lines of defence, and pointing towards the curtain. See the article TENAILLE.

FLANKING *Line of Defence*. See the article LINE *of Defence*.

FLATS, in muſic, a kind of additional notes, which, together with ſharps, ſerve to remedy the defects of muſical inſtruments, wherein temperament is required. See TEMPERAMENT and SHARP.

FLATULENCY, in medicine, a diſorder of the bowels ariſing from a weak ſtomach, and crude flatulent aliment, as peaſe, beans, lentils, coleworts, hard fat fleſh, &c. which degenerate into wind, creating great anxiety if not evacuated, and difficulty of breathing.

Another cauſe of flatulencies are congeſtions of blood in the branches of the vena porta; whence proceed anxieties of the præcordia, difficult breathing, cholic pains, heart-burn, head-achs, vertigo, and watchfulneſs.

If the flatulency ariſes from crudities in the ſtomach, evacuations are firſt of all neceſſary; after which may be given bitters, aromatics, carminatives, and ſtrengtheners, with a ſpare diet and exerciſe. If it proceeds from congeſtions of blood, as is the caſe of hypochondriacs, a vein muſt be opened; and if the body is coſtive, an emollient clyſter or a gentle laxative will be proper. If theſe fail, chalybeate medicines are to be called in, as tincture of vitriol of iron, ſteel-filings finely powdered, from ſix to ten grains, or oil of cinnamon with ſugar or bitters, ſpaw-waters, and conſtant exerciſe.

FLAX, *Linum*, in botany, a plant from which linen is manufactured.

There are ſeveral ſpecies of this plant, which are preſerved in ſome curious gardens of plants for variety ſake; but, as they are of little uſe or beauty, it would be needleſs to expatiate on them in this place.

The linum ſativum, or manured flax, is that which is cultivated for uſe in divers parts of Europe, and is reckoned an excellent commodity: the right tilling and ordering of which is eſteemed a good piece of huſbandry.

This ſhould be cultivated upon a rich ſoil that has not been ploughed for ſeveral years, upon which flax always makes the beſt improvement: but, as it draws greatly from the ſoil, it ſhould not be ſown two years together upon the ſame ground. The land muſt be well ploughed, laid flat and even, upon which the ſeeds ſhould be ſown about the middle

middle of March, when the weather is mild and warm. During the ſpring, you muſt carefully weed it; which if neglected, eſpecially in a moiſt ſeaſon, the weeds will over-grow and deſtroy the crop. There are ſome perſons who recommend the feeding of ſheep with flax, when it is a good height; and ſay, they will eat away the graſs and weeds, and do the flax good; and if they ſhould lie in it, and beat it down, or flatten it, the next rain that falls it will riſe again: but this muſt not be practiſed but in a moiſt ſeaſon, and upon a rich ſoil; for if the ground be poor, or the ſpring dry, it will not riſe again to any conſiderable height.

The beſt ſeed is that which comes from the Eaſt country, and is known by the name of Riga flax; for if the Engliſh ſeed be ſown three or four times, it is very apt to degenerate. If the ſeed be good, two buſhels will be enough to ſow an acre; but if it be but middling, there ſhould be a greater allowance.

Towards the latter end of Auguſt the flax will begin to ripen, when you muſt be careful that it grow not over ripe; therefore you muſt pull it up as ſoon as the heads begin to change brown, and hang downwards, otherwiſe the ſeeds will ſoon ſcatter, and be loſt; ſo that the pluckers muſt be nimble, and tie it up in handfuls, ſetting them upright till they be perfectly dry, and then houſe them. If the flax be pulled when it firſt begins to flower, it will be whiter and ſtronger than if it ſtand till the ſeed is ripe; but then the ſeed will be loſt.

This is a plant of the greateſt uſe in ſeveral of the moſt eſſential parts of life: from the ſeeds an expreſſed oil is drawn, which is of great uſe in medicine, painting, &c. from the bark of the ſtalks is made linen, and from the rags of linen is made paper: ſo that this plant may be eſteemed as one of the moſt valuable and neceſſary in many of the principal conveniencies of life. *Miller's Gard. Dict.*

This plant has a more oily taſte than mallow, and is the chief of the emollient tribe. The ſeeds afford an excellent medicine, ſince from them is expreſſed an oil, which is anodyne, demulcent, and extremely adapted to all manner of aſperities; it relaxes, and diſſolves acridities, whence it is of extraordinary ſervice in the moſt deſperate cholics. The ſtiff and rigid limbs, being anointed with this oil, are relaxed and rendered flexible. This oil, when freſh drawn, and taken at the mouth, is very good in a pleuriſy, and a cough, to help expectoration; and, injected in clyſters, is very proper in the hæmorrhoids, and indurated fæces, whence proceeds the cholic; mixed with ſealed and japan earth, it is a great arcanum in the dyſentery: an emulſion of the ſeeds is of ſervice in the pleuriſy and peripneumony; the oil is a very good remedy againſt the ſtone: the ſeeds reduced to a meal, and boiled and prepared in the form of a cataplaſm, are applied to tumours and abſceſſes, in order to mollify and ripen them. The ſeed, boiled in water, makes a mild oily decoction, preſcribed to be drank as an anodyne in inflammations of the ſmall inteſtines, the diarrhœa, the dyſentery, nephritic pains, and retention of urine. The oil, boiled with honey, clears the face and ſkin of ſpots, and all cutaneous blemiſhes. The leaves are emollient, and the ſmell of the flowers is not poiſonous, as ſome authors have written. To cloſe all, we ſhould obſerve, that whereas cotton can never be uſed about wounds, on account of its denticulated parts, which diſpoſe to inflammations; linen, the manufactured produce of this plant, is, by its extraordinary ſoftneſs, ſmoothneſs, and flexibility, of all other things, the beſt adapted to ſuch purpoſes. *Hiſt. Plant. aſcript. Boerhaave.*

As it is agreed that the lighteſt loams and the thickeſt crop afford the fineſt flax, it may be of uſe to let the farmer know how he may ſave ſuch crops from lodging, as they generally do. The method is a little expenſive; but if it anſwers, it will quit coſt very well. When the flax is in the ground, divide your field into equal ſquares, the ſides of which may be four or five feet long; and at each angle thruſt a forked ſtick ſteady in the ground. When your flax is ſome inches high, lay from ſtick to ſtick a light croſs pole; and this will ſupport the flax, and hinder it from lodging. Some uſe ropes inſtead of poles; but they yield too much, and anſwer but imperfectly.

High winds are ſo common in this country, that there is reaſon to apprehend, that the Dutch method of laying flax looſe upon the ground would be attended with conſiderable inconveniency. The following method is much ſafer: tie gently each handful as cloſe as may be to the heads; and then, ſpreading out the ends, ſet it upright on the ground. Three or four of theſe, together, make one ſtook; and into ſuch ſmall ſtooks divide all the flax you have. They ſoon dry, becauſe the wind has free acceſs to the ſtalks, as the ſun has to the heads, and the rain cannot lodge in any quantity upon them.

Rippling comes next. Two men may work at every inſtrument, by fixing it on a bench, that one may ſit at either end. Let them take ſmall handfuls at a time, and draw the flax through the ripple without violence. Two women to each bench are neceſſary to hand the flax in bundles to the ripplers, to receive it from them again, to ſort it according to their ſeveral degrees of length, ſtrength, ripeneſs, and fineneſs, and to tie it looſely in little ſheaves.

After rippling, the ſeed muſt be carried to the granary, and the flax laid down to water. If poſſible, diſpoſe of the whole into your ponds together. The ſummer, which draws haſtily towards an end, is your fitteſt ſeaſon, and ſhould be huſ-

handed with care: however, let nothing tempt you to uſe bog-holes and running waters. It is better to delay to the next ſeaſon, than to diſcolour or damage all your flax.

Cover your flax, to keep it down, with your ſlutch or mire at the bottom of your ponds, or, till that be gathered in ſufficient quantities, with clay, ruſhes, fern, or timber. From four to twelve or thirteen days is the time requiſite for watering. After the fourth, examine your flax daily, and be particularly careful not to let it lie too long. It is a miſtake, on the ſafer ſide, to draw it off the ſooneſt.

In graſſing, the ſhorteſt graſs ſhould be preferred. Dry ſand-banks do well. On either the flax muſt be turned every ſecond day, and generally lies from a fortnight to three weeks.

To dry your flax, heat your oven thoroughly; then let it cool, till a man can ſtand in it without uneaſineſs; fill it over night, and your flax will be ready for the break next morning. The dirt and ſtraws ſcutched out of the flax in one day, will heat the oven for the next.

When you break your flax, take ſheaf by ſheaf out of the oven, as you uſe it: it comes criſp under the engine, works the better and more eaſily. It is an error to lay the flax, as we do, as far as may be from the joint. The nearer it is placed to the center of motion in the break, the more eaſily it ſplits, and the leſs damage it receives.

In ſcutching, chuſe the broad round ſcutch: the ſquare and narrow one, in uſe among us, cuts and deſtroys the flax.

By the time the flax is ſcutched, and about the middle of October, it will be time to threſh the ſeed.

This may be done by driving horſes backwards and forwards on the bows, or by drawing over them a heavy rolling-ſtone upon a ſmooth hard floor.

Cleaning it requires more nicety. To do it thoroughly, it muſt firſt go through the winnow, which ſeparates it from the bows; through the riddle next, to take out ſtraws, ſtones, and larger dirt; then ſucceſſively through two different ſieves; the firſt bored with oval holes, to let through the ſeed, and nothing elſe of greater bulk; the ſecond cloſer, to retain the ſeed, and afford a paſſage to all ſmaller bodies; and laſtly, through the ſcreen or wire-harp, which frees it from all duſt.

When the flax-dreſſer has thus cleaned his ſeed, he ſhould return to his flax, and put it through the fining-mills. The wheel in theſe turns alternately from right to left, and from left to right, twice each way; and, according to the number of theſe double turns, the flax comes out the finer, the ſmoother, and the ſofter. Fourſcore ſuch turns is the moſt that any flax requires, and probably as much as it will bear.

N. B. For want of theſe fining-mills in Scotland beating of flax is directed.

In hackling, women and children ſhould be employed from choice. They work with greater gentleneſs than men; and care and tenderneſs are the main excellencies in this buſineſs. For the beſt flax, four ſets of hackles will be requiſite, each of them of a different fineneſs: through theſe it may be drawn ſucceſſively, and every time with proportionable caution. The laſt, whoſe teeth are like the fineſt needles, requires the utmoſt ſkill, and ſhould be truſted with few hands.

FLEA, *Pulex*, in zoology, a genus of inſects without wings, of a roundiſh, compreſſed figure: the legs are three pair, and formed for leaping; the eyes are two, and ſimple; the mouth is bent downwards; the colour is a deep purple, approaching to black.

FLEA-BITTEN, that colour of a horſe, which is white or grey, ſpotted all over with dark reddiſh ſpots. See HORSE.

FLEAM, in ſurgery and farriery, an inſtrument for letting a man or horſe blood.

FLEECE, the covering of wool, ſhorn off the bodies of ſheep. See WOOL.

Order of the Golden FLEECE, an order of knighthood inſtituted by Philip II. duke of Burgundy. Theſe knights were at firſt twenty-four, beſides the duke himſelf, who reſerved the nomination of ſix more; but Charles V. increaſed them to fifty. He gave the guardianſhip of this order to his ſon Philip, king of Spain; ſince which, the Spaniſh monarchs are chiefs of this order. The knights had three different mantles ordained them; at the grand ſolemnity, the collar and fleece.

FLEET, in naval affairs, a company of ſhips of war, or merchantmen, or both, bound on any particular expedition or voyage.

As the ſecurity, wealth, and glory of theſe kingdoms principally depend on the reſolution and ſkill with which our fleets are conducted, it may be thought neceſſary to give our readers, who are unacquainted with this ſubject, a clearer idea of the operations of fleets and ſquadrons, than they may have formed before; this we more cheerfully attempt, as it ſeems to have been wholly neglected hitherto in works of this kind.

The principal article to be conſidered in a fleet at ſea is order, by which is meant the different methods of ranging or drawing it up in ſeveral lines and forms for which it may be deſigned: in which, two things are to be conſidered; firſt, the poſition of each ſhip with regard to the wind; ſecond, the poſition of each ſhip with reſpect to the fleet. We cannot make any alteration in either of the circumſtances without changing the whole poſition of the line, which will otherwiſe remain complete. See the article LINE.

When a fleet engages, it ought to be drawn up

in a different form from that in which it ſails. A fleet that ſails in ſight of an enemy muſt alter its poſition from that it would maintain, were there none in view, or none to be expected. When a fleet ſails before the wind, it has likewiſe its particular form of ſailing, as it has alſo when it chaſes an enemy, makes a retreat, guards a ſtreight or paſſage, or is obliged to force through one; or whether at anchor in a road or harbour, or going into either, to inſult or attack an enemy. In this variety of circumſtances, proper regard muſt be had to the moſt advantageous poſition or form the fleet can be ranged in, before it enters upon action.

There are three things to be conſidered before we can judge of the good form or diſpoſition of a fleet. 1. If that form puts it into the beſt diſpoſition of executing the admiral's deſign; ſuch as the moſt expeditious, as well as moſt commodious, order of ſailing on any enterprize, &c. or if, when obliged to retreat, ſuch arrangement ſecures it beſt from the attacks or purſuits of an enemy. 2. If that order cloſes the fleet more or leſs; becauſe the cloſer the ſhips are, they are the leſs liable to be ſeparated; the ſeveral commanders can better aid and aſſiſt each other upon any occaſion, and have the eaſier communication with their reſpective admirals and commanding officers. 3. If from this order the line of battle may be eaſieſt formed; becauſe all orders muſt tend principally to that, as the only one to engage to advantage. See EVOLUTION.

In a naval engagement, as we ſhall fully explain in that article, the ſhips are drawn up in a line of battle in two columns parallel to each other, cloſe upon a wind. CLOSE-HAULED.

There are ſeveral advantages which reſult from being to windward, as 1. the fleet to windward can edge down on the enemy, when and as near as ſhall be judged convenient; conſequently regulates the time and diſtance moſt advantageous to come to action; 2. if the fleet to windward is more in number, it may eaſily detach ſome ſhips to ſend after the rear of the enemy, which muſt undoubtedly throw them into confuſion; 3. if any of the ſhips of the fleet to leeward ſhould be diſabled, whether in the van or rear, or even in the center, the fleet to windward may with the greater eaſe ſend down their fire-ſhips upon them, or ſend a detachment after any part of the flying enemy: 4. we muſt alſo attribute, amidſt other advantages of being to windward, that of being ſooner freed from the inconvenience of the ſmoke of the enemy, as well as of our own; for the wind repelling the ſmoke of the cannon back again into the ſhip, ſo greatly incommodes thoſe who are quartered at the guns as to deprive them totally for ſome time of the ſight of the enemy.

On the other hand, the advantages of being to leeward are likewiſe conſiderable, inſomuch that there are who maintain they are at leaſt equal to thoſe of being to windward; but if all circumſtances are duly conſidered, they will certainly find the advantages of being to windward the greateſt a fleet can poſſibly have, whether ſuperior or inferior to the enemy; though we muſt allow, that, on ſome occaſions, as when the wind blows hard, it may be more adviſeable to get to leeward, if we can, eſpecially if the ſea runs ſo high that the weather, or windward fleet, cannot open its loweſt tier, when obliged to engage a great number of ſhips, or in an action between two ſingle ſhips.

1. The fleet to leeward fire to windward, and conſequently the ſhips may make uſe of their lower tier of guns, without being under apprehenſion that any ſudden ſquall of wind ſhould over-power them by the water ruſhing in irreſiſtably between decks; an advantage which the Engliſh fleet, under Sir Edward Hawke, had in ſome meaſure over the French fleet, commanded by M. Conflans, in that memorable action off Belleiſle, Nov. 20, 1759, where they fatally experienced our ſuperior ſkill, reſolution, and ſeamanſhip. This circumſtance is certainly the greateſt advantage a fleet to leeward can have; for it is difficult to conceive the confuſion and terror which ſudden guſts of wind occaſion amongſt the men between decks, when the waves pour in and lay the ſhip on her broadſide, ſo as often to endanger her overturning, or ſinking before the ports can be ſecured.

2. The fleet to leeward may eaſier cover any of their ſhips which are diſabled in action, which the fleet to windward cannot effect without great difficulty, and even the riſk of being deſtroyed in the attempt.

3. The fleet to leeward may more eaſily make a retreat if defeated, whereas the fleet to windward cannot ſo well eſcape, without being reduced to the neceſſity of forcing its way through the enemy's line, which muſt be attended with the moſt fatal conſequences.

When a fleet is obliged to retreat in ſight of an enemy, the beſt way to ſecure its retreat will be by ſailing in a ſort of half-moon, the admiral being in the center, the fleet divided and ranged in order, one half on the ſtarboard, and the other half ſtretching out on the larboard ſide, and keeping the fire-ſhips, tranſports, &c. in the middle. This manner of ranging a fleet ſeems the moſt adviſeable, becauſe the enemy can never approach thoſe who endeavour to eſcape, without expoſing themſelves at the ſame time to the fire of the ſhips to windward. If the admiral thinks this form gives too great an extent to his fleet, he may eaſily cloſe his wings or quarters, and make the half-moon more complete; in the midſt of which he may place his convoy in ſafety.

The moſt natural courſe, however, in this form of

of ſailing, is to ſteer away before the wind: but if neceſſary, the ſhips may bear away large on either tack, or even may keep cloſe upon a wind.

In chaſing a fleet that endeavours to eſcape, the beſt cruiſers are detached after them, in order to pick up the ſtragglers or force them to action: the body of the victorious fleet ſhould keep the ſame order or line with the enemy, as nigh as poſſible, to be ready for action if neceſſary. This, however, is only to be underſtood when the fleet that is chaced may not be ſo inferior to the other, but that it may hazard an action; for if the one bears no proportion to the other, they muſt bear down upon them in the ſame manner as a conquering army aſhore carries all before it when it has forced an enemy's camp: otherwiſe, were the conquerors to wait drawing up in form, the enemy would undoubtedly take the advantage of ſuch an opportunity to make their eſcape.

In order to protect the entrance of a ſtreight or paſſage in the moſt effectual manner, there ſhould be a fleet nearly double in number to that which would force its way through; there muſt then be two diviſions made, the one to keep one ſide while the other is ranged along the other, that when the enemy preſent themſelves at the entrance, the weathermoſt ſquadron may crowd all the ſail it can before the wind upon them, at the ſame time that the leeward ſquadron keeps its wind to intercept them: ſo that in this manner it will be impoſſible for the enemy to eſcape by any manœuvre it may attempt. The eſſential point of a commanding officer who attempts to force a paſſage, is to avail himſelf of the reigning winds which may beſt favour his deſigns, and poſſibly it would be moſt expedient to range his ſquadron in the form of a retreat, by cloſing the wings or quarters a little, to give them the leſs extent; in this the ſquadron can never be attacked without being able to defend itſelf from all quarters to greater advantage than in the former poſition.

When a fleet comes to an anchor, there are five circumſtances to be conſidered: 1. that the ground be good and holding; 2. that the place be well ſheltered againſt the reigning winds which blow on that coaſt; 3. that the ſhips may eaſily get under ſail with the ſame wind that may ſerve an enemy, and at the ſame time be able to diſpute the advantage of the wind with them; 4. that they may readily form the line as ſoon as they get under ſail; 5. that the ſhips may have room to keep clear of each other in getting under way, in order to which they ſhould be regularly anchored in one or many lines, about three cables length aſunder, and one hundred and twenty fathoms between each ſhip.

When a fleet is under a neceſſity of continuing at ſea in bad weather, it ſhould form itſelf into three columns, leaving a great interval between each ſhip, without at the ſame time widening the diſtance between the columns; ſo that it may be in this manner leſs liable to be ſeparated, and the ſhips in leſs danger of falling aboard each other.

If the ſhips have a good offing and ſea room enough to drive, they will lie-to under their courſes; which will ſubject them to labour leſs, and not ſtrain ſo much on their maſts, rigging, &c. but if they ſhould not have drift enough, they muſt lie-to under their main-ſails, or mizens only, which will ſtill keep them much eaſier than if they were under no ſail at all.

Laſtly, if a fleet deſigns to force into an harbour, wind, weather, &c. permitting, ſome ſhips ſhould be ordered to divert the out-forts, by coming to an anchor and placing themſelves in ſuch a manner as to bring their broadſides to bear upon them: when that is accompliſhed, the briſk and continued fire of a ſhip will greatly diſtreſs the enemy; but more eſpecially againſt ſtone-works, which fly about and do great execution, whilſt the main body of the fleet puſhes into harbour.

FLEETING, among ſailors, changing the ſituation of a tackle, when the blocks or pullies are drawn together: the uſe of fleeting is to ſeparate the powers which produce any great effort, that the force may be increaſed, which is deſtroyed by their meeting.

FLEMISH, or the FLEMISH-TONGUE, is that which we otherwiſe call Low-Dutch, to diſtinguiſh it from the German, of which it is a corruption, and a kind of dialect. See GERMAN.

It differs from the Walloon, which is a corruption of the French language. The Flemiſh is uſed through all the provinces of the Netherlands.

FLEMISH BRICKS, a neat, ſtrong, yellow kind of bricks, brought from Flanders, and commonly uſed in paving yards, ſtables, &c. being preferable for ſuch purpoſes to the common bricks. See BRICK.

FLESH, *Caro*, in anatomy, a ſimilar fibrous part of an animal body, ſoft and bloody, being that of which moſt of the other parts are compoſed, and whereby they are connected together; or more properly, it is ſuch parts of the body where the blood-veſſels are ſo ſmall, as only to retain blood enough to preſerve their colour red.

FLESH, among botaniſts, is all the ſubſtance of any fruit that is between the outer rind and the ſtone; or that part of any root that is fit to be eaten.

FLESH-COLOUR. See CARNATION.

FLEUR DE LISEE, in heraldry, the ſame with flory. See the article FLORY.

FLEXIBLE, in phyſics, a term applied to bodies capable of being bent or diverted from their natural figure or direction.

FLEXION, in anatomy, is applied to the motion by which the arm or any other member of the body is bent. It is alſo applied to the muſcles, nerves, &c.

FLEXOR, in anatomy, a name applied to several muſcles, which are ſo called from their office, which is to bend the part to which they belong, in oppoſition to the extenſors, which open or ſtretch them.

FLINT, *Silex*, in natural hiſtory, a ſemi-pellucid ſtone, compoſed of cryſtal debaſed with earth, of one uniform ſubſtance, and free from veins; but of different degrees of colour, according to the quantity of earth it contains, and naturally ſurrounded with a whitiſh cruſt.

Oil of FLINTS, a name given to the liquor obtained from a mixture of four ounces of calcined and powdered flints, with twelve ounces of ſalt of tartar; this being melted together in a ſtrong fire, runs into glaſs, which is to be powdered and ſet in a cellar, where it runs into an oil per deliquium.

FLOAT *of a Fiſhing-Line*, the cork or quill that floats or ſwims above water.

FLOAT alſo ſignifies a certain quantity of timber bound together with rafters, athwart, and put into a river to be conveyed down the ſtream; and even ſometimes to carry burdens down a river.

FLOAT-BOARDS, thoſe boards fixed to water-wheels of under-ſhot mills, ſerving to receive the impulſe of the ſtream; whereby the wheel is carried round. See the articles WHEEL and MILL.

FLOATAGES, all things floating on the top of the ſea or any water; a word much uſed in the commiſſions of water-bailiffs.

FLOATINGS, in huſbandry, the drowning or watering of meadows.

FLOATING *of Cheeſe*, among houſewives, ſeparating the whey from the curd. See CHEESE.

FLOOD, a deluge or inundation of waters. See the article DELUGE.

FLOOKING, among miners, a term uſed to expreſs a peculiarity in the load of a mine. The load or quantity of ore is frequently intercepted in its courſe by the croſſing of a vein of earth or ſtone, or ſome different metallic ſubſtance; as in which caſe the load is moved to one ſide, and this tranſient part of the land is called a flooking.

FLOOR, in architecture, the under ſide of a room, or that part we walk on.

FLOOR, in ſhip-building, the bottom of a ſhip, or all that part on each ſide of the keel, which approaches nearer to an horizontal than a perpendicular ſituation; whence it is common to ſay, a ſharp floor, a flat floor, a long floor, &c. whence,

FLOOR-TIMBERS, are thoſe which are placed immediately acroſs the keel, upon which the bottom of the ſhip is framed, and the upper parts of the timbers are conſtructed. See TIMBER.

FLORAL, in general, ſomething belonging to a flower. See FLOWER.

Thus floral leaves are thoſe found only near flowers.

FLORAL GAMES, in Roman antiquity, annual games inſtituted in honour of the goddeſs Flora, which began to be celebrated on the fourth of the calends of May, or the twenty-eighth of April, and were continued to the calends, of firſt of May.

FLORID STYLE is that too much enriched with figures and flowers of rhetoric.

FLORILEGE, *Florilegium*, a name the Latins have given to what the Greeks call ἀνθολογιον, anthology. See the article ANTHOLOGION.

FLORIN is ſometimes uſed for a coin, and ſometimes for a money of account.

Florin, as a coin, is of different values, according to the different metals and different countries where it is ſtruck. The gold florins are moſt of them of a very coarſe alloy, ſome of them not exceeding thirteen or fourteen carrats, and none of them ſeventeen and a half. As to ſilver florins, thoſe of Holland are worth about 1 *s.* 8 *d.* thoſe of Genoa were worth 8¼ *d.* ſterling.

Florin, as a money of account, is uſed by the Italian, Dutch, and German merchants and bankers, but admits of different diviſions at different places: in Holland it is on the footing of the coin of that name, containing twenty ſtivers. At Franckfort and Nuremberg it is equivalent to 3 *s.* ſterling, and is divided into creutzers and pfinnings; at Liege it is equivalent to 2 *s.* 3 *d.* at Straſbourg, to 1 *s.* 8 *d.* in Savoy, to 11 *d.* at Genoa, to 8½ *d.* and at Geneva, to 6½ *d.* See the article COIN.

FLORINIANS, *Floriniani*, in church hiſtory, a ſect of heretics, of the ſecond century, ſo denominated from their leader Florinus, who made God the author of evil.

They are a ſpecies of the gnoſtics, but deny the judgment and reſurrection, and hold that our Saviour was not born of a virgin. They were alſo called borborites. See the article BORBORITES.

FLORIST, *Floriſta*, according to Linnæus, is an author, or botaniſt, who writes a treatiſe called Flora, comprehending only the plants and trees to be found growing naturally in any place. However, in the more common acceptation of the word, floriſt ſignifies a perſon well ſkilled in flowers, their kinds and cultivation. See the article FLOWER.

FLORY, FLOWRY, or FLEURY, in heraldry, a croſs that has the flowers at the end circumflex and turning down, differing from the potence, inaſmuch as the latter ſtretches out more like that which is called patee. See the article POTENCY and PATEE.

FLOS, or FLOWER, in botany. See the article FLOWER.

FLOS, in chemiſtry, the moſt ſubtile part of bodies ſeparated from the groſs parts by ſublimation, in a dry form.

FLOSCULOUS, among botaniſts, an appellation given to compound flowers made up of a number of leſſer ones, all incloſed in the ſame common cup.

The plants with floſculous flowers make one of Tournefort's claſſes, called by Linnæus ſyngeneſia. See the articles BOTANY and SYNGENESIA.

FLOUR, the meal of wheat-corn, finely ground and ſifted. See MEAL.

FLOWER, *Flos*, among botaniſts and gardeners, the moſt beautiful part of trees and plants, containing the organs or parts of fructification. See the article FRUCTIFICATION.

The parts of a flower are the ovary or piſtil, the corolla or flower-petals, the ſtamina or chives, the empalement or calyx, the perianthium, pericarpium, and fruit. See the articles PISTIL, COROLLA, STAMINA, &c.

According to the number of petals, or flower-leaves, flowers are called monopetalous or one-leaved, dipetalous or two-leaved, tripetalous or three-leaved, &c. Flowers are again diſtinguiſhed into male, female, and hermaphrodite: the male flowers are thoſe containing ſtamina, without any piſtil or fruit, commonly called ſtamineous flowers. The female flowers are ſuch as contain the piſtil, which is ſucceeded with fruit; theſe are called fruitful or knitting flowers. The hermaphrodites are thoſe which contain the organs of both ſexes, viz. ſtamina and piſtils; and theſe are by far the moſt numerous.

From the different figures and diſpoſition of the flower-leaves of plants, Mr. Tournefort has eſtabliſhed a ſyſtem of botany; whereas that of Linnæus is chiefly founded on the number and diſpoſition of the ſtamina. See BOTANY.

Flowers were in great requeſt among the ancients: they adorned their temples, houſes, and even tombs with them; but their principal uſe ſeems to have been at entertainments, where the gueſts were always decked with flowers, and even the room ſtrewed with them.

Quincy tells us, that flowers, deſigned for medicinal uſe, ſhould be plucked when they are moderately blown, and on a clear day before noon: and that for conſerves, roſes muſt be taken in the bud.

For the method of preſerving ſpecimens of flowers, ſee the article HORTUS SICCUS.

Eternal FLOWER, the Engliſh name of the xeranthemum. See XERANTHEMUM.

Everlaſting FLOWER, the Engliſh name of the gnaphalium. See GNAPHALIUM.

FLOWER-FENCE, the Engliſh name of the poinciana. See POINCIANA.

FLOWER-DE-LUCE, the ſame with the iris. See IRIS.

Sultan-FLOWER, the ſame with the cyanus. See CYANUS.

Sun-FLOWER, the Engliſh name of the helianthus. See HELIANTHUS.

Trumpet FLOWER, the ſame with the bignonia. See BIGNONIA.

Wind-FLOWER, the ſame with the anemone. See ANEMONE.

FLOWERS, in chemiſtry. See the article FLOS.

FLOWER-DE-LIS, or FLOWER-DE-LUCE, in heraldry, a bearing repreſenting the lilly, called the queen of flowers, and the true hieroglyphic of royal majeſty; but of late it is become more common, being borne in ſome coats one, in others three, in others five, and in ſome ſemee, or ſpread all over the eſcutcheon in great numbers.

The arms of France are, three flowers de lis or, in a field azure.

FLOWING SHEET, in the ſea-language; the ſheets are ropes faſtened to the lower corners of the ſails, and they are ſaid to be flowing when the wind is fair or large, as it is termed by ſeamen, as the ſheets are at this time not drawn ſo tight as when the ſhips are cloſe hauled.

A ſhip is ſaid to have a flowing ſheet when the wind croſſes the line of her courſe at right-angles, that is to ſay, a ſhip ſteering north, with the wind at eaſt, has a flowing ſheet; for if ſhe were cloſe-hauled, ſhe would ſteer two points nearer the wind, viz. N. N. E. See the article CLOSE-HAULED.

FLOX, among dyers, ſignifies well cleaned wool, uſed to abſorb the colours of cochineal.

FLUENT, in fluxions, the flowing quantity, or that which is continually either increaſing or decreaſing, whether line, ſurface, ſolid, &c. See FLUXION.

It is eaſy to find the fluxions, where the fluents are given; but, on the contrary, it is very difficult to find the fluents of given fluxions.

FLUID, in phyſiology, an appellation given to all bodies, whoſe particles eaſily yield to the leaſt partial preſſure, or force impreſſed.

Some philoſophers make the following diſtinction in fluids; thoſe which flow or ſpread themſelves till their ſurfaces become level or horizontal, they call liquid; in contradiſtinction to flame, ſmoke, vapour, &c. which are alſo fluids, but do not acquire ſuch a ſurface. Thoſe which are capable of exciting in us the idea of moiſtneſs, as water, &c. they call humid, diſtinguiſhing them thereby from air, quickſilver, and melted metals. But theſe diſtinctions are quite unneceſſary in a philoſophical ſenſe; the ſurfaces of all fluids being level, or horizontal, when not prevented by the bodies about them: and humidity is only a relative quality; for though quickſilver will not moiſten or ſtick to a man's finger, it will to ſilver or gold. See FLAME, SMOKE, LIQUID, &c.

FLUOR, in phyſics, a fluid, or more properly, the ſtate of a body that was before hard or ſolid, but is now reduced by fuſion, or fire, into a ſtate of fluidity.

FLUOR, in mineralogy, implies a ſort of mineral concretion, frequently found amongſt ores and ſtones, in mines and quarries.

FLUOR ALBUS, or WHITES, in medicine, is a discharge of whitish gleety matter by the natural parts of the fair sex. This humour issues sometimes from the vessels of the uterus, and sometimes from the glands of the vagina. In the former case the discharge is suppressed during the time of the menstrual courses; in the latter, it subsists with them, and continues even in the time of pregnancy.

In both species of the disease the principal intention ought to be directed towards mending the habit of body, from some fault in which they derive their origin: but when the seat of the distemper is in the vagina, it will, however, require topical applications.

Wherefore, generally speaking, it will be proper to begin the cure by giving a vomit, especially with ipecacuanha wine; frequent purging is indicated, chiefly with rhubarb; which may by taken either in substance, with the addition of aromatics, and in some cases of a little calomel now and then; or in the tincture of rhubarb in wine. And the laxity of the fibres requires astringents, particularly such as have steel in their composition.

As to external or topical remedies, which I have said are necessary, when the vagina is the seat of the disease; we ought carefully to avoid applying all such as are powerful repellers of the peccant humours: for those only are serviceable which deterge and heal the little ulcers of that membrane. For my part, I have often, with great success, ordered the patient to inject a small quantity of Bates's aqua aluminosa, or of the camphorated vitriolic water, with a little Egyptian honey added to either, into the vagina through a proper syringe, at repeated times: and it will be of some service to fumigate the vagina now and then with a powder made with equal parts of frankincense, mastich, amber, and cinnabar of antimony, thrown on burning coals. *Mead's Monita Præcepta.*

FLUSH-DECK, or deck flush fore and aft, in ship-building, the upper deck of a ship, which has no rising at either end, only the common curve, or gradual ascent from the middle towards the stem and stern, called by sailors the sheer.

FLUTE, *fistula*, an instrument of music, the simplest of all those of the wind kind. It is played on by blowing it with the mouth, and the tones or notes are changed by stopping and opening the holes disposed for that purpose along its side. The ancient fistulæ, or flutes, were made of reeds, afterwards of wood, and last of metal: but how they were blown, whether as our flutes, or as hautboys, does not appear.

German FLUTE, is an instrument entirely different from the common flute. It is not, like that, put into the mouth to be played, but the end is stopt with a tompion, or plug; and the lower lip is applied to a hole about two inches and a half, or three inches distant from the end. This instrument is usually about a foot and a half long; rather bigger at the upper end than the lower; and perforated with holes, besides that for the mouth, the lowest of which is stopped and opened by the little finger's pressing on a brass, or sometimes, a silver key, like those in hautboys, bassoons, &c. It is found exceeding sweet and agreeable, and serves as a treble in a concert.

FLUTES, or FLUTINGS, in architecture, perpendicular channels, or cavities, cut along the shaft of a column, or pilaster. They are chiefly affected in the Ionic order, where they had their first rise; though, indeed, they are used in all the richer orders, as the Corinthian and Composite; but seldom in the Doric, and scarce ever in the Tuscan.

Each column has twenty-four flutes, and each flute is hollowed in exactly a quadrant of a circle; but the Doric has but twenty. Between the flutes are little spaces that separate them, which Vitruvius calls stria, and we lists: though, in the Doric, the flutes are frequently made to join to one another without any intermediate space at all; the list being sharpened off to a thin edge, which forms a part of each flute.

Sometimes the flutings are made flat, and are called facettes; but these have never such a good effect as the others. Vitruvious says, that when there are flutings in the column, there ought also to be eggs and anchors in the quarter-round of the capital, and even pearls and olives, in a baguette, to be made underneath, instead of annulets. These eggs and olives ought to be in the same number with the flutings, and to be regularly distributed.

FLUX, in medicine, an extraordinary issue, or evacuation, of some humours of the body.

FLUX of the urine. See DIABETES.

FLUX, in hydrography. See TIDE.

FLUX, in metallurgy, whatever can cause any body, otherwise not at all, or hardly, fusible by fire, to melt.

Fluxes, says Dr. Shaw, seem reducible to two general kinds, viz. the vitreous and the saline. By the vitreous we understand all those which either have of themselves, or readily assume, a glassy form in the fire; among the principal of which are reckoned the glass of lead, the glass of antimony, and borax. By the saline kind of fluxes are understood all those that are composed of salts, whether tartar, nitre, fixed alcali, or the like.

FLUXIONS, in the mathematics, according to their great inventor, are not magnitudes, but the velocities with which magnitudes (varying by a constant motion) increase or diminish; and the magnitudes thus generated are called the fluents of those fluxions. This definition is, as nearly as could possibly be expressed, the substance of the author's own words, in the introduction to his quadrature

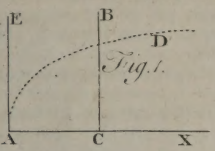


Fig. 1.

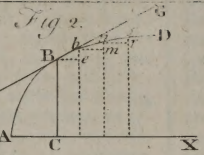


Fig. 2.

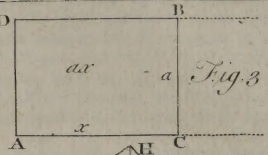
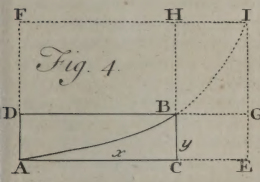


Fig. 3



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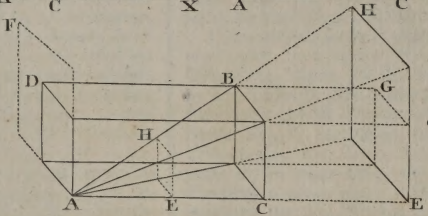

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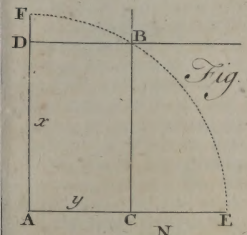
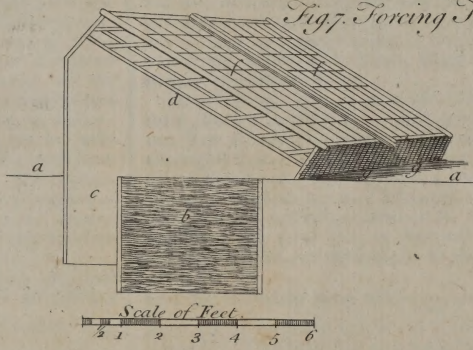


Fig. 6.

Fig. 7. Forcing Frame.



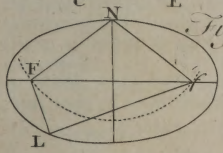


Fig. 8.

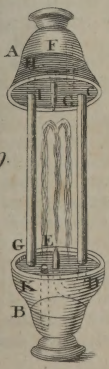


Fig. 9.

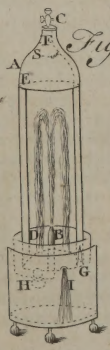


Fig. 10.

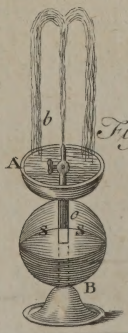


Fig. 11.

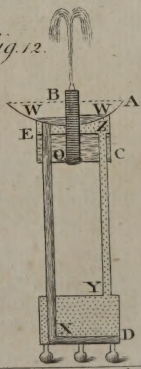


Fig. 12.

T. Sedger Sculp.

drature of curves, where he says, "I consider mathematical quantities, in this place, not as consisting of very small parts, but as described by a continued motion. Lines are described, and thereby generated, not by the apposition of parts, but by the continued motion of points; superficies by the motion of lines, &c. therefore, considering that quantities which increase inequal times, and by increasing are generated, I sought a method of defining quantities from the velocities of the motions, or increments with which they are generated, and calling these velocities of the motions, or increments, fluxions, and the generated quantities, fluents, &c." We have been the more particular in this definition that we might avoid the ill-natured criticisms of little pretenders to science; for we have very lately seen an author, of the most distinguished merit, treated in a very scurrilous manner for a small deviation therefrom, notwithstanding he has, by that means, conveyed the idea of a fluxion in a much more plain manner than had before been done; and, at the same time, no error could possibly arise in the application by considering them in that manner.

As the doctrine of fluxions is the most noble and comprehensive of all the mathematical sciences (for it may not improperly be called a science of itself) we shall, as we have done of the others, first give a short history of its rise and improvements, and the rather, as the invention has been claimed by two persons; in which we shall endeavour to demonstrate, that Sir Isaac Newton was the real and only inventor, and that Mr. Leibnitz only made some slight and trivial alterations from the hints he, from time to time, received from Mr. Oldenburgh, and the inventor himself; and secondly, explain the method itself, in the most plain and comprehensive manner possible.

Dr. Wallis, in his *Opus Arithmeticum*, published in 1657, cap. 33. prop. 68. reduced the fraction $\frac{A}{1-R}$ by a continual division into the series $A+AR+AR^2+AR^3+AR^4+$, &c. Lord viscount Brounker squared the hyperbola by this series, $\frac{1}{1\times 2}+\frac{1}{3\times 4}+\frac{1}{5\times 6}+\frac{1}{7\times 1}+$, &c. that is, by this $1-\frac{1}{2}+\frac{1}{3}-\frac{1}{4}+\frac{1}{5}-\frac{1}{6}+\frac{1}{7}-\frac{1}{8}+$, &c. conjoining each two terms into one; which was published in the Philosophical Transactions for April 1668.

Soon after, M. Mercator published a demonstration of this quadrature by Dr. Wallis's division; and not long after that, Mr. James Gregory gave a geometrical demonstration thereof; and these books were, a few months after, sent by Mr. John Collins to Dr. Barrow at Cambridge, and by Dr. Barrow communicated to Mr. Newton in June 1669, then a fellow of Trinity college; whereupon Dr. Barrow sent Mr. Collins, in return, a tract of Mr. Newton's, entitled, *Analysis per æquationes numero terminorum infinitas*, and contains a general method of doing that in all curves, which lord Brounker and M. Mercator did in the hyperbola alone; and though the latter lived upwards of ten years after, yet he never proceeded any farther than to the single quadrature of the hyperbola: the progress made by Mr. Newton as to all curves in general shews, that he did not want M. Mercator's assistance; however, to avoid cavilling, he allows that both lord Brounker had invented, and M. Mercator demonstrated the series for the hyperbola some years before they published it, and consequently before he himself had found out his general method.

This treatise is likewise mentioned by Mr. Newton himself, in a letter to Mr. Oldenburgh, dated October 24, 1676; also by several letters written by Mr. Collins to Mr. James Gregory in Scotland, Mr. Berlet and Mr. Vernon at Paris, as well as to several English gentlemen, viz. Mr. Strode, Mr. Oldenburgh, Mr. Dary, &c. These letters are dated in the years 1669, 1670, 1671, and 1672. Numberless other proofs might be brought to demonstrate that Mr. Newton had found out this method of determining the area of all sorts of curves and their rectification, together with the superficies and contents of solids from given right-lines, and *vice versa*, as he expresses himself in his above-mentioned letter to Mr. Oldenburgh, which he calls a compendium of these series.

Mr. Newton, in a letter to Mr. Oldenburgh, dated June 13, 1676, shewed, in a general manner, how to reduce any power of a binomial into a converging series; and also how, by that series, to square that curve whose ordinate is that power: therefore, by assuming, as is demonstrated by Dr. Wallis in his Arithmetica Infinitorum, that if the abscessa of any curve be x, m and n any integers, and the ordinate, at right-angles to the abscessa, be $x^{\frac{m}{n}}$ the area of the figure will be $\frac{n}{m+n}x^{\frac{m+n}{n}}$; he had a general expression for the area of all curves of that kind. This letter was communicated by Mr. Oldenburgh to Mr. Leibnitz, and Mr. Leibnitz afterwards desired a farther explanation of it, which was sent him in a letter dated October 24, following, from which it is plain that Mr. Leibnitz was so far from having invented any thing of this kind, that he did not, from the Compendium contained in that letter, fully understand it.

Moreover, Mr. Newton, in his above-mentioned Compendium, amongst many other examples, sets down this: Let the radius of a circle be 1, the arch z, and the sine x; the equations for finding the arch whose sine is given, and for finding the sine whose arch is given, will be

$$z=x+\tfrac{1}{6}x^3+\tfrac{3}{40}x^5+\tfrac{5}{112}x^7, \text{ &c.}$$
$$x=z-\tfrac{1}{6}z^3+\tfrac{1}{120}z^5-\tfrac{1}{5040}z^7+, \text{ &c.}$$

Mr. Collins informed Mr. Gregory of this method in autumn 1669, and Mr. Gregory, by the help,

help of one of Mr. Newton's ſeries, after a year's ſtudy, found out the method in December, 1670; and two months after, in a letter dated Feb. 15, 1671, ſent ſeveral theorems, diſcovered thereby, to Mr. Collins, with leave to communicate them freely; and Mr. Collins was very free in communicating whatever he received either from Mr. Newton or Mr. Gregory, as appears by his letters printed in the *Commercium*; amongſt the Series Mr. Gregory ſent in the ſaid letter, were theſe two; let the radius of a circle be r, the arch a, and the tangent t, the equations for finding the arch whoſe tangent is given, and the tangent whoſe arch is given, will be theſe:

$$a = t - \frac{t^3}{3r^2} + \frac{t^5}{5r^4} - \frac{t^7}{7r^6} +, \&c.$$

$$t = a + \frac{a^3}{3r^2} + \frac{2a^5}{15r^4} + \frac{17a^7}{315r^6} +, \&c.$$

In the year 1671, M. Leibnitz publiſhed two tracts at London, the one dedicated to the Royal Society, and the other to the Academy of Sciences at Paris; and in the dedication of the firſt he mentioned his correſpondence with Mr. Oldenburgh: in Feb. 167$\frac{2}{3}$, M. Leibnitz, meeting with Dr. Pell at Mr. Boyle's, pretended to the differential method of Mouton; and notwithſtanding Dr. Pell ſhewed him, that it was Mouton's method, he perſiſted in maintaining it to be his own invention, pretending that he had found it himſelf, without knowing what Mouton had done before, and that he had improved it much. When one of Mr. Newton's Series was ſent to Mr. Gregory, he tried to deduce it from his own Series combined together, as he mentions in his letter, dated Dec. 19, 1670; and by ſome ſuch method M. Leibnitz, before he left London, ſeems to have found the ſum of a Series of fractions decreaſing *in infinitum*, whoſe numerator is a given number, and the denominators triangular, pyramidal, or triangulo-triangular numbers, &c.

About the latter end of February or beginning of March 167$\frac{2}{3}$, M. Leibnitz went from London to Paris, and continued his correſpondence with Mr. Oldenburgh to the following June; then he learned algebra and the higher geometry; and in July 1674 he renewed his correſpondence with Mr. Oldenburgh and Mr. Collins, and he wrote, that he was maſter of a wonderful theorem, which gave accurately the area of a circle, or any ſector thereof, in a ſeries of rational numbers; and in October following, that he had found the circumference of a circle, in a ſeries of very ſimple numbers, and that by the ſame method (ſo he calls the ſaid theorem) any arch, whoſe ſine was given, might be found in a like ſeries, though the ratio to the whole circumference were not known; his theorem, therefore, amounted to the finding any ſector or arch, whoſe ſine was given; if the ratio of the arch to the whole circumference was not known, the theorem or method gave him only the arch; if it was known it alſo gave him the whole circumference; and therefore it was the firſt of Mr. Newton's two theorem's above-mentioned; but M. Leibnitz did not then know the demonſtration of this theorem; for, in his letter of May 12, 1676, he deſired Mr. Oldenburgh to procure the demonſtration from Mr. Collins, meaning the method by which Mr. Newton had invented it.

In a letter of Mr. Collins's, dated April 15, 1675, Mr. Oldenburgh ſent Mr. Leibnitz eight of Mr. Newton's and Mr. Gregory's ſeries, amongſt which were Mr. Newton's two ſeries above-mentioned, for finding the arch, whoſe ſine is given, and the ſine whoſe arch is given; and Mr. Gregory's two ſeries above-mentioned, for finding the arch whoſe tangent is given, and the tangent, whoſe arch is given; and Mr. Leibnitz, in his anſwer, dated May 20, 1675, acknowledged the receipt of this letter, and promiſed to compare them with thoſe of his own invention, which he ſeemed to intimate had been invented many years before, but never took any farther notice of it, except to inform the public (in the Acta Eruditorum, for April, 1691) that he had invented ſomething like it on that ſubject in the year 1675, at which time he had found out the demonſtration of one of thoſe ſeries, and wrote to Mr. Oldenburgh to procure him Mr. Newton's demonſtration of the others; this Mr. Newton did in a letter dated June 13, 1676, and which was ſent to him at Paris, June 26, together with a manuſcript, containing Extracts from Mr. James Gregory's Letters, who was now dead, and which contained all, or the greateſt part, of his inventions of that kind, and which appears farther by Mr. Leibnitz's and Mr. Tſchirnhauſe's anſwers concerning them.

M. Leibnitz's anſwer, directed to Mr. Oldenburgh, and dated Auguſt 27, 1676, begins thus, "Your letter, dated July 26, contains ſeveral, and thoſe more extraordinary things in analyſis, than a great many voluminous books publiſhed on this ſubject; wherefore, I thank both you, Mr. Newton, and Mr. Collins for communicating to me ſo many curious things;" and towards the end of the letter, after he had done with the contents of Mr. Newton's letter, he proceeds thus; "I come now to other things contained in your letter, which the learned Mr. Collins was pleaſed to communicate; I wiſh he had added the demonſtration of Mr. Gregory's linear approximation, for he certainly had a genius for promoting ſuch ſpeculations:" And M. Tſchirnhauſe's anſwer, dated September 1, 1676, after he had done with Mr. Newton's letter about ſeries, concludes thus, "and what that excellent geometrician Mr. Gregory has done in this matter are certainly extraordinary; and indeed ſuch as ſhall cauſe his MSS to be publiſhed, ſhall do the greateſt ſervice to his reputation:" In the firſt part of this

letter

letter, where M. Tschinhause speaks of Mr. Newton's series, he says, he looked over them cursorily, to see if he could find M. Leibnitz's series for squaring the circle, or hyperbola; but if he had searched for it in the extracts of Mr. Gregory's letters, he might have found it in the abovementioned letter of February 15, 1671; for, the MS. of those extracts, with that letter therein, is still extant in the hand-writing of Mr. Collins.

And though M. Leibnitz had now received this series twice from Mr. Oldenburgh, yet in his letter of August 27, 1676, he sent it back to him by way of recompence for Mr. Newton's method, pretending, he had communicated it to his friends at Paris three years before, and upwards; that is, two years before he received it in Mr. Oldenburgh's letter of April 15, 1675; at which time he did not know it to be his own, as appears by his answer of May 20, 1675, abovementioned: he might receive this series at London, and communicate it to his friends at Paris above three years before he sent it back to Mr. Oldenburgh; but it does not appear, that he had the demonstration thereof so early; which when he had found out, he then exhibited in his Opusculum, and communicated it to his friends, and he himself has told us, that this was in 1675: however, it lies upon him to prove, that he had this series, before he received it from Mr. Oldenburgh; for, in his answer to Mr. Oldenburgh he did not know any of the series, then sent him, to be his own; and he concealed from the gentlemen at Paris his having received it from Mr. Oldenburgh, with several other series, and his having seen a copy of the letter, in which Mr. Gregory had sent it to Mr. Collins in the beginning of the year 1671: in the same letter of August 27, 1676, after M. Leibnitz had described his quadrature of the circle, and equilateral hyperbola, he adds; "again from the series of regressions I found the following for the hyperbola, *viz.* if any number be less than unity, as $1-m$, and its hyperbolic logarithm be l, m will be $= \frac{l}{1} - \frac{l^2}{1\times 2} + \frac{l^3}{1\times 2\times 3} - \frac{l^4}{1\times 2\times 3\times 4}$ +, &c. if the number be greater than unity, as $1+n$, then, for finding it, I have likewise discovered the rule, expressed in Mr. Newton's letter, viz. n will be $= \frac{l}{1} + \frac{l^2}{1\times 2} + \frac{l^3}{1\times 2\times 3} + \frac{l^4}{1\times 2\times 3\times 4}$ +, &c. — and as to the regression from arches, I directly lighted upon the rule that from the given arch gives the co-sine; viz. the co-sine $= 1 - \frac{a^2}{1\times 2} + \frac{a^4}{1\times 2\times 3\times 4}$ —, &c. but afterwards I likewise found, that from this rule might be demonstrated that other communicated to me for finding the right sine, which is $\frac{a}{1} - \frac{a^3}{1\times 2\times 3} + \frac{a^5}{1\times 2\times 3\times 4\times 5}$ —, &c. Thus M. Leibnitz put in his claim for the co-invention of these four series, though the method of finding them was sent him at his own request, which yet he could not understand; for, in the same letter of August 27, 1676, he desired Mr. Newton to explain it farther, his words are as follows; "but I want Mr. Newton should explain some things farther; as the origin of the theorem he first lays down; the method, by which in his operations, he found the quantities p, q, r; and in fine, how he proceeds in the method of regressions, as when from the logarithm the number is sought; for, he does not explain how that is deduced from his method."

He pretended to have found two series for the number whose logarithm was given, and yet in the same letter he desired Mr. Newton to explain the method of finding those very two series.

When Mr. Newton received this letter, he wrote back, that he had already communicated to him all the said four series, the two former being one and the same series, putting the letter l for the logarithm with its sign + or —; and the third the excess of the radius above the versed sine, for which a series had been formerly sent him; upon this, M. Leibnitz desisted from his claim: besides, Mr. Newton in the same letter, dated October 24, 1676, farther explained his methods of regression, as M. Leibnitz had desired; and yet M. Leibnitz in his letter of June 21, 1677, desired a farther explication; but soon after, upon reading Mr. Newton's letter a second time, he wrote back July 12, 1677, that he now understood what he wanted, and found by his papers, that he had formerly used one of Mr. Newton's methods of regression; but as in the example which he then chanced to use, there was nothing elegant, he had, out of his usual impatience, neglected to use it any farther: he had, therefore, several direct series, and, consequently, a method of finding them, before he invented the inverse method, but afterwards forgot it; and if he had searched his old papers more diligently, he thinks he might also have found this method there, but having forgot his own methods, he wanted Mr. Newton's.

A copy of a letter of Mr. Newton's, dated December the 10th, 1672, was likewise sent to M. Leibnitz by Mr. Oldenburgh, amongst Mr. James Gregory's papers, at the same time with Mr. Newton's letter of June 13, 1676. And Mr. Newton having mentioned in these two letters, that he had a very general analysis, partly consisting of the method of converging series, and partly of another method, whereby he applied those series to the solution of almost all problems, (excepting perhaps some numeral ones, like those of Diophantus) and found out the tangents, area's, lengths, solid contents, centres of gravity and curvities of curves, and curvilinear figures, either geometrical or mechanical, without sticking at surds; and that Slu-

ſius's method of tangents was but a branch or corollary of this other method; M. Leibnitz, having ſeen theſe in his return home through Holland, was then only meditating the improvement of Sluſius's method; for, in a letter to Mr. Oldenburgh, dated from Amſterdam, November $\frac{18}{28}$, 1676, he wrote thus; "the method of tangents, publiſhed by Sluſius, does not reach ſo far but that ſomething farther might be done in that kind, that would be of very great uſe in all ſorts of problems, even in my method (without extractions) of reducing equations to ſeries; to wit, a certain ſhort table of tangents might be calculated and continued ſo far, till its progreſſion appear, ſo that any one might continue it as far as he pleaſed, without any calculation." This was the improvement of Sluſius's method into a general one, which M. Leibnitz was then meditating, and by his words, ſomething farther might be done in that kind, that would be of very great uſe in all ſorts of problems; but the improvement by the differential Calculus was not yet thought of, for that muſt be referred to the following year.

Mr. Newton in his next letter, dated October 24, 1676, mentioned the Analyſis, communicated by Dr. Barrow to Mr. Collins in 1669, and alſo another tract written in 1671, about converging ſeries, and about the other method, whereby tangents were drawn according to that of Sluſius, and the Maxima and Minima determined, and the quadrature of curves made more eaſy, and this without ſticking at radicals; and by which all ſeries were invented, which in certain caſes broke off, and gave the quadrature of curves in finite equations, when it might be done; and he comprehended the foundation of theſe operations in this ſentence, expreſſed enigmatically as above, "having an equation given that involves any number of flowing quantities to find their fluxions, and *vice verſâ*:" which puts it paſt all diſpute, that he had invented the method of fluxions before that time; and if other things in that letter be conſidered, it will appear, that he had then brought it to great perfection, and made it exceeding general; ſince the propoſitions in his book of quadratures, and the methods of converging ſeries, and of drawing a curve line through any number of given points, were then known to him; for, when the method of fluxions does not proceed in finite equations, he reduces the equations into converging ſeries by the binomial theorem, and by the extraction of fluents out of equations, either involving, or not involving their fluxions; and when finite equations are wanting, he deduces converging ſeries from the conditions of the problem, by aſſuming the terms of the ſeries gradually, and determining them by thoſe conditions; and when fluents are to be deduced from fluxions, and the law of the fluxions is wanting, he finds that law very nearly, by drawing a parabolic line through any number of given points; and by theſe improvements Mr. Newton had in thoſe days made his method of fluxions much more univerſal than the differential method of M. Leibnitz is at preſent: this letter of Mr. Newton's, dated October 24, 1676, was ſeen by M. Leibnitz at London in the latter end of the winter, or beginning of the ſpring following, and he had a copy of it at Hanover the beginning of the enſuing ſpring; and M. Leibnitz ſoon after replied in a letter, dated June 21, 1677; "I agree with Mr. Newton, that Sluſius's method of tangents is ſtill imperfect; and I have long ago handled the ſubject more generally, *viz.* by the differences of the ordinates." Hence, for the future, calling dy the difference of the two neareſt y, &c. Here at length M. Leibnitz firſt began to propoſe his differential method, and there is not the leaſt evidence, that he knew it before the receipt of Mr. Newton's laſt letter; he ſays indeed, "that he had a long time ago handled the ſubject of tangents more generally, *viz.* by the differences of the ordinates;" and ſo he had affirmed before in other letters, that he had invented ſeveral converging ſeries, both direct, and inverſe, before he had any method of inventing them; and had forgot an inverſe method of ſeries before he perceived its uſefulneſs; but no man is allowed a witneſs in his own cauſe, and therefore it lies upon M. Leibnitz's friends to prove, that he found out this method before the receipt of Mr. Newton's letters; and if they cannot prove this, the queſtion, who was the firſt inventor of the method, is decided.

In November 1684, M. Leibnitz publiſhed the elements of this differential method in the Acta Erudit. which he illuſtrated with examples of drawing tangents, and determining Maxima and Minima, and then added; "and theſe indeed, are the rudiments of a certain kind of ſublimer geometry, that reaches even to the moſt difficult, and curious problems of mixed mathematics, and which, without the differential calculus, or ſome ſuch method, are not readily to be attempted." The words, ſome ſuch method, plainly relate to Mr. Newton's; and that whole period contains nothing more than what Mr. Newton had affirmed of his general method in his letters of 1672 and 1676. And in the Acta Erudit. of June 1686, p. 297. M. Leibnitz added, "I chooſe rather to make uſe of dx and the like than of ſingle letters, in their ſtead, becauſe dx is a certain kind of modification of x itſelf, &c." He knew very well that in this method he might conveniently enough have uſed ſingle letters with Dr. Barrow, but he choſe rather to uſe the new ſymbols dx and dy, though nothing can be done by them, but what with more conciſeneſs and advantage may be done by ſingle letters.

The next year Mr. Newton's Principia Philoſoph. came out, a book full of ſuch problems, as M. Leibnitz called the moſt difficult and curious, &c. And the Marquis De l'Hoſpital ſpeaks thus of it; "it is almoſt entirely compoſed by this calculus:" and

M. Leibnitz himſelf in a letter to Mr. Newton, dated from Hanover, March $\frac{7}{17}$, 1693, and ſtill extant in his own hand-writing, and exhibited to the Royal Society, acknowledged the ſame thing in theſe words; "you had ſurpriſingly enlarged geometry by your ſeries, but by your Principia you have ſhewn, that you have penetrated into what was beyond the reach of the common analyſis; I have likewiſe attempted, by making uſe of proper ſymbols to expreſs the ſums and differences, to reduce in ſome meaſure to analyſis, that geometry I call the tranſcendental, and I have not been unſucceſsful."

The celebrated Dr. Wallis had received copies of Mr. Newton's two letters of June 13, and October 24, 1676, from Mr. Oldenburgh, and had publiſhed ſeveral things out of them in his algebra; ſoon after which he was adviſed to print the letters entire, becauſe Mr. Newton's method of fluxions began to paſs in Holland with great applauſe, under the title of Mr. Leibnitz's Method of Differentials, he therefore took notice of this in the preface to the firſt volume of his works, publiſhed in 1695; and in a letter to Mr. Leibnitz, he informs him of his reaſons for ſo doing, which, though couched in pretty plain terms, Mr. Leibnitz never thought proper to contradict, or complain of, until after the doctor's deceaſe, though in the Acta Eruditorum, for June, in the following year, he complains that the Dr. had not informed the public that he was maſter of the Calculus, when thoſe letters paſſed between Mr. Oldenburgh and him.

This was the ſtate of the diſpute when Dr. Wallis died, which was in October, 1703. Till this time, Mr. Leibnitz pretended to nothing more than that he invented the method apart, without any aſſiſtance from Mr. Newton; he allowed that Mr. Newton was the older inventor, but Dr. Wallis being the laſt of the old mathematicians, who knew any thing of the beginning of the diſpute, and he happily ſilenced, Mr. Leibnitz thought it a fair opportunity for putting in a farther claim, and, therefore, when Mr. Newton publiſhed his Treatiſe on the Quadrature of Curves, in 1704, Mr. Leibnitz, in the Acta Erudit. of January, 1705, in giving an account of this book, repreſented, that he was the firſt inventor of that method, and that Sir Iſaac had only ſubſtituted fluxions for differences. This gave riſe to the famous diſpute between Mr. Keill and him; for Mr. Keill, in a letter publiſhed in the Philoſophical Tranſactions, 1708, retorted the accuſation, aſſerting that "Mr. Newton was, beyond all diſpute, the firſt inventor of the arithmetic of fluxions, as would eaſily appear to any one that reads his letters, publiſhed by Dr. Wallis; though the ſame method, by only changing the name and manner of notation, was afterwards publiſhed by M. Leibnitz in the Acta Erudit."

Before Mr. Newton ſaw what had been publiſhed in the Acta Erudit. he expreſſed himſelf offended at the printing of this paragraph of Mr. Keill's letter, leaſt it ſhould cauſe a diſpute; and M. Leibnitz, putting a worſe conſtruction on it than Mr. Keill intended, complained of it as a calumny in a letter to Dr. Sloane, dated March 4, 1711, N. S. and moved, that the Royal Society would cauſe Mr. Keill to make a public recantation: but Mr. Keill inſiſted he would prove and defend what he had written; and Mr. Newton, upon being ſhewn the accuſation in the Acta Erudit. gave him leave ſo to do; but M. Leibnitz, in a ſecond letter to Dr. Sloane, dated December 29, 1711, inſtead of making good his accuſation, as he was bound to do, that it might not be deemed a calumny, inſiſted only upon his own candour, as if it would be injuſtice to queſtion it; and refuſed to tell how he came by the method; and ſaid that the Acta Erudit. had given every man his due, and that he had concealed the invention upwards of nine years (he ſhould have ſaid ſeven years) that no body might pretend (he means that Mr. Newton might not pretend) to have been before him in it; and called Mr. Keill a novice, unacquainted with things paſt, and one that acted without authority from Mr. Newton, and a clamorous man who deſerved to be ſilenced, and deſired, that Mr. Newton himſelf would give his opinion in the matter: he knew, that Mr. Keill affirmed nothing more than what Dr. Wallis had publiſhed thirteen years before, without being then contradicted: he knew, that Mr. Newton had given his opinion in this matter in the introduction to his book of quadratures, publiſhed before this controverſy began; but Dr. Wallis was now dead; the ſurviving mathematicians in England are reckoned novices; M. Leibnitz would aſſume to himſelf to queſtion any man's candour without injuſtice, and Mr. Newton, unleſs he would either diſſemble or deny the matter, muſt be involved in wrangling and diſputes.

The Royal Society, therefore, having as much authority over M. Leibnitz, as over Mr. Keill, as being two of their members, and being now twice preſſed by M. Leibnitz to interpoſe, and thinking it unjuſt either to condemn, or cenſure Mr. Keill without enquiring into the matter; and knowing, that neither Mr. Newton, nor M. Leibnitz (the only perſons alive who knew and remembered any thing of what had paſſed in theſe matters forty years before) could be witneſſes for, or againſt Mr. Keill, appointed a numerous committee to ſearch old letters and papers, and report their opinion upon what they ſhould find; and as ſoon as this report was made, they ordered the letters and papers, with the report of their committee, to be publiſhed; and by theſe letters and papers it appeared, that Mr. Newton had the method in or before the year 1669, and that M. Leibnitz had it not before the year 1677.

So

So much for the hiſtorical part of this curious article.—We ſhall now proceed to deliver the principles thereof as briefly as a ſubject of ſo intricate a nature will permit. And firſt,

A fluxion, according to our definition, is the velocity with which any quantity, at any given point or term of it, flows; that is, increaſes or decreaſes.

Thus, if we ſuppoſe the indefinite right-line AE (plate LV. *fig.* 1.) to move with a parallel motion along the axis AX, or ſo as always to be parallel to its firſt ſituation; and, at the ſame time, ſuppoſe a point to move from A, along the ſaid line AE, ſo as to generate or always to be in the curve AD: then, the velocity with which the end or point A, of the line AE, arrives at any point C, or, which is the ſame, the velocity with which the axis flows or is generated at any particular point C, is the fluxion of the abſciſs AC at that point: the velocity with which the point moves along the line AE at any point B, is the fluxion of the ordinate at that point: and, the velocity with which the point generates or moves along the curve at any particular point B, is the fluxion of the curve at that point. So likewiſe, the velocity with which the curvilineal ſpace ACB flows, or is generated by the line AE, at any term CB, is the fluxion of the ſaid curvilineal ſpace at that time.

Now, if the velocity with which any quantity flows, or is generated, be at every point or term the ſame; that is, if it be neither accelerated or retarded; the fluxion of it will likewiſe be at every point or term the ſame: but, if this velocity be continually increaſed or diminiſhed, then there will be a certain degree of velocity, or fluxion, peculiar to every point or term of the thing deſcribed: and the velocity wherewith the given velocity, at any point or term, is either accelerated or retarded, is called the fluxion of the fluxion, or the ſecond fluxion. And, again, if this acceleration or retardation be not uniform, but is increaſed with different degrees of proportion at different points or terms, then the velocity or ſwiftneſs of this acceleration or retardation, is called the third fluxion. And ſo on.

Increment, is the indefinitely ſmall increaſe of a quantity, generated in an indefinitely ſmall particle of time.

Thus, if we ſuppoſe *bc* (*fig.* 2.) indefinitely near and parallel to the ordinate BC, and B*e* parallel to the abſciſs AC; then C*c*, or its equal B*e*, will be the increment of the abſciſs AC; *eb* the increment of the ordinate CB; B*b* the increment of the curve AB; and CB*bc* the increment of the curvilineal ſpace ABC.

Now, if *nd* be ſuppoſed indefinitely near and parallel to *bc*, and *bm* equal and parallel to B*e* or *cd*, then the difference between *eb* and *mn*, is called the increment of the increment, or the ſecond increment; i. e. the increment of *eb*, or ſecond increment of CB. And, again, if *sf* be ſuppoſed indefinitely near and parallel to *nd*, and *nr* equal and parallel to *bm* or *df*, then the difference between the ſecond increment, and the difference of *mn* and *rs*, is called the third increment of CB. And ſo on.

Note, when a quantity, inſtead of increaſing, is continually diminiſhed, then the indefinitely ſmall particles, by which it is leſſened, are not increments, but decrements; and both increments and decrements are ſometimes called moments.

Now, if we ſuppoſe the abſciſs AC to flow on with an uniform motion, or equal parts of it to be deſcribed in equal times, its increment will accurately expreſs, or be exactly as its fluxion; ſince velocity is always as the ſpace uniformly deſcribed in a given time: and if the curve B*b* did exactly coincide with the tangent or right-line TBG, it is evident, that then, the increments B*b* and *be*, would likewiſe be deſcribed with uniform motions, and with the ſame degrees of velocity with which the curve and ordinate reſpectively flow at the point B; that is, the increments B*b* and *be*, would then be accurately as the fluxions of the curve and ordinate at the point B. But, ſince not two points of the curve are coincident with the tangent, therefore the velocities with which the increments are generated, are continually varying in every point; ſo, therefore, the increments and fluxions are not in an exact proportion to each other; or, the increments do not accurately meaſure the velocities or fluxions with which they begin to be generated. However, as the point *b* is continually nearer to a coincidence with the tangent BG, the nearer it approaches the point of contact B; ſo, therefore, if we conceive the ordinate C*b*, to move back, till it coincides with CB; then, the very firſt moment before its coincidence, the curve B*b* and right-line BG, will be infinitely, or rather indefinitely near to a coincidence with each other; and conſequently, in that caſe, the increments B*b* and *be* will come indefinitely near to meaſure the fluxions of the curve and ordinate, or the velocities with which they reſpectively flow at the point B. Or, becauſe the particles of time in which any increments are generated, are ſuppoſed to be indefinitely ſmall, and conſequently the acceleration or retardation of the velocity with which they are generated muſt be ſo too; therefore, they are indefinitely near in proportion to the fluxions of the quantities of which they are increments: but, when the ratio from that of equality, is but indefinitely ſmall, or leſs than can be aſſigned, it may be conſidered as equal; and therefore, the increments may be taken as proportional to, or (becauſe velocity is expreſſed by the ſpace uniformly deſcribed in a given time) for the fluxions in all operations; and, on the contrary, the fluxions for the increments.

Note, thoſe quantities which are ſuppoſed to flow, or to be generated by continual increaſe, are called,

called fluents, and variable or flowing quantities: and those which admit of no variation (as the parameter of a parabola, the diameter of a circle, &c.) are called permanent, given, and invariable quantities.—The beginning of the alphabet, viz. a, b, c, d, &c. is used to express invariable quantities; and the end, viz. z, y, x, &c. variable or flowing quantities: and the fluxions of those variables, viz. $\dot{z}, \dot{y}, \dot{x}$, &c. are respectively denoted by $\dot{z}, \dot{y}, \dot{x}$, &c. and their second fluxions, or the fluxions of $\dot{z}, \dot{y}, \dot{x}$, &c. by $\ddot{z}, \ddot{y}, \ddot{x}$, &c. their third fluxions, or the fluxions of $\ddot{z}, \ddot{y}, \ddot{x}$, &c. by $\dddot{z}, \dddot{y}, \dddot{x}$, &c. and so on. Also, the moment, increment, or decrement, of z, is denoted by z, of y by y, of x by x &c. and the second moments, increments, or decrements of z, y, x, &c. or the moments, increments, or decrements of $\dot{z}, \dot{y}, \dot{x}$, &c. by z'', y'', x'', &c. and so on.—The fluxions, increments, &c. of invariable quantities, viz. of a, b, c, d, e, &c. are $=o$.

Those fluents which are supposed to be generated in the same time, or in equal times, are called contemporary fluents; and the fluxions of these contemporary fluents, are called contemporary fluxions. Now, it is evident, if two or more of these contemporary fluents are always equal, or in any certain constant ratio to each other, that their contemporary fluxions will likewise be equal, or in the same proportion: and that, on the contrary, if two or more of these contemporary fluxions are always equal, or in any certain constant ratio to each other, their contemporary fluents will likewise be equal, or in the same proportion.

We come now to find the fluxions of fluents, or the velocities with which flowing quantities increase or decrease at any terms assigned; the business of which is called the Direct Method of Fluxions. But, before we proceed, it may, perhaps, be necessary to premise a few things concerning the different ways of expressing an algebraic quantity, by some called the New Notation, and which was first introduced by the celebrated Dr. Wallis, whom we have so often had occasion to mention in the former part of this article. Thus $\sqrt[3]{xx}$ may be expressed more commodiously by $x^{\frac{2}{3}}$, and $\sqrt{xxx}$ by $x^{\frac{3}{2}}$, $\sqrt{a-x}$ by $\overline{a-x}^{\frac{1}{2}}$ and universally $\sqrt[n]{x^m} = x^{\frac{m}{n}}$.

Moreover it may be observed, that to divide any quantity by a power with an affirmative exponent, is the same as to multiply it by the same power with a negative exponent; as for example:

$$\frac{x}{\overline{a-y}^{\frac{1}{2}}} = x \times \overline{a-y}^{-\frac{1}{2}} \text{ or } \frac{x}{\overline{a-y}^{\frac{m}{n}}} = x \times \overline{a-y}^{-\frac{m}{n}}$$

and the contrary. Also $x^2 \times x^{\frac{3}{2}} = x^{2+\frac{3}{2}} = x^{\frac{7}{2}}$; $\overline{x^3}^2 = x^{3\times 2} = x^6$ and universally $x^m \times x^n x^{m+n}$. The observation of these hints may often be found of use in transforming of fluxions, which will sometimes be necessary before their fluents can be properly attained.

We shall now proceed to shew the method of finding the fluxion of a given fluent; for the doing of which observe the following rules.

Rule I. To find the fluxion of a simple fluent; or, of that wherein there is but one variable letter.

Mark the variable letter, or flowing term, with a dot over it.

Thus, the fluxion of ax is $= a\dot{x}$.

For, if we suppose the variable rectangle A B, (*fig.* 3.) to be generated by the given line C B, setting out from the situation A D, and moving along with a parallel motion between the parallel and indefinite sides A C and D B; it is evident, the velocity with which the rectangle flows, is equal to the generating line C B drawn into the velocity with which the point C generates, or moves along the line A C: that is, the fluxion of the rectangle A B, is equal to the invariable line C B drawn into the fluxion of the flowing or variable line A C. Therefore, if A D or C B $= a$, and A C or D B $= x$, then the fluxion of the rectangle ax will be $= a \times \dot{x} = a\dot{x}$.

Rule II. To find the fluxion of the product of two or more quantities drawn into each other.

Multiply the fluxion of each quantity separately, by the other, or the product of the rest of the quantities: and the sum of these products will be the fluxion required.

Thus, the fluxion of xy is $= \dot{x}y + x\dot{y}$; the fluxion of axy is $= o xy + a\dot{x}y + ax\dot{y}$, i. e. $= a\dot{x}y + ax\dot{y}$; the fluxion of xyz is $= \dot{x}yz + x\dot{y}z + xy\dot{z}$; and the fluxion of $axyz$ is $= a\dot{x}yz + ax\dot{y}z + axy\dot{z}$.

1°. That the fluxion of xy is $= \dot{x}y + x\dot{y}$, may be thus demonstrated.

Suppose a line, coincident with the indefinite right line A F, to move with a parallel motion along the indefinite right line A E; and, at the same time, another, coincident with the line A E, to move with a parallel motion along the line A F; and that the said two lines move with such different degrees of velocity, that their points of intersection may always be in the curve A I. Through any point B of the curve, draw C H parallel to A F, and D G parallel to A E. Then, by the line moving along the line A E, will the curvilineal space A E I and rectangle D E be generated; and, by the line moving along the line A F, the curvilineal space A F I and rectangle C F will be generated. Now, before the line moving along the line A E arrives at the situation C H, it is evident, that, the

curvilineal ſpace AEI will increaſe flower, or flow with a leſs degree of velocity than the rectangle DE, and afterwards with a greater; therefore, at the term CB, they will flow with one and the ſame degree of velocity. So likewiſe, the curvilineal ſpace AFI will flow or increaſe flower, or with a leſs degree of velocity, than the rectangle CF, before the generating line, moving along the line AF, comes to the ſituation DG; and afterwards, faſter, or with a greater degree of velocity; and therefore, at the term DB, they will increaſe or flow with an equal degree of velocity. That is, the fluxion of the curvilineal ſpace AEI, is, at the term CB, equal to the fluction of the rectangle DE at the ſaid term CB; and the fluxion of the curvilineal ſpace AFI, is, at the term DB, equal to the fluxion of the rectangle CF at the term DB. But the fluxion of the rectangle DE, at the term CB, is equal to CB drawn into the fluxion of AC; and the fluxion of the rectangle CF, at the term DB, is equal to DB drawn into the fluxion of AD. Hence, therefore, the fluxion of the flowing rectangle ACBD (which is the ſum of the two curvilineal ſpaces ACB and ADB), is equal to the ſum of CB drawn into the fluxion of AC, added to DB drawn into the fluxion of AD: that is, if we put AC or DB $= x$, and AD or CB $= y$, the fluxion of the rectangle xy will be $= \dot{x}y + x\dot{y}$.

2°. Hence, the fluxion of axy is $= a\dot{x}y + ax\dot{y}$; for, ſince xy is always in the ſixt ratio to axy, of 1 to a; therefore the fluxion of xy is to the fluxion of axy, as 1 to a: that is, $1 : a :: \dot{x}y + x\dot{y} : a\dot{x}y + ax\dot{y} =$ the fluxion of axy.

3°. And, that the fluxion of xyz is $= \dot{x}yz + x\dot{y}z + xy\dot{z}$, may thus be proved. Let the length, breadth, and depth, of a parallelopipedon, be repreſented by x, y, and z, reſpectively. Now, this parallelopipedon will be equal to three pyramids, whoſe baſes are xy, xz, and yz, and altitudes z, y, and x, reſpectively: and therefore, the ſum of the fluxions of theſe pyramids, will be equal to the fluxion of the parallelopipedon xyz. Let either of the pyramids be repreſented as in *fig.* 4. by AEH or ACB, which ſuppoſe to be generated by the variable plane AF moving with a parallel motion along the indefinite right line AE; and, at the ſame time, let the parallelopipedon ADGE (whoſe face AD or EG is equal and ſimilar to the baſe of the pyramid at the term CB), be generated by the plane AD, which is coincident with the plane AF. Now, it is plain, that the pyramid will increaſe flower, or flow with a leſs degree of velocity, than the parallelopipedon, before the generating planes arrive at the term CB; and afterwards faſter, or with a greater degree of velocity: therefore, at the ſaid term CB, they will flow, or be generated, with the ſame or an equal degree of velocity: but, it is likewiſe plain, that the velocity with which the parallelopipedon is generated, is equal to its face AD or CB drawn into the velocity of its motion along the line or ſide AE; therefore, the velocity with which the pyramid is generated is, at the term CB, equal to its baſe CB drawn into the velocity of its motion at the point C, along the ſide AE: that is, the fluxion of the pyramid ACB, is equal to its baſe CB drawn into the fluxion of its altitude AC. Hence then, when the baſe is xy, and altitude z, the fluxion of the pyramid is $= xy \times \dot{z} = xy\dot{z}$; and, when the baſe is xz and altitude y, the fluxion of it is $= xz \times \dot{y} = x\dot{y}z$; and, laſtly, when the baſe is yz and altitude x, its fluxion is $= yz \times \dot{x} = \dot{x}yz$. Conſequently, $\dot{x}yz + x\dot{y}z + xy\dot{z}$ (which is the ſum of the fluxions of the three pyramids) is $=$ the fluxion of the parallelopipedon xyz.

4°. And that the fluxion of $axyz$ is $= a\dot{x}yz + a\dot{x}y\dot{z} + axy\dot{z}$, follows from the above Dem. 3°. for ſince $xyz : axyz :: 1 : a$, therefore $1 : a ::$ fluxion of xyz : fluxion of $axyz$; i. e. $1 : a :: \dot{x}yz + x\dot{y}z + xy\dot{z} : a\dot{x}yz + ax\dot{y}z + axy\dot{z} =$ the fluxion of $axyz$.

Rule III. To find the fluxion of a fraction.

Multiply the denominator into the fluxion of the numerator; from the product of which, ſubtract the numerator drawn into the fluxion of the denominator: then divide the remainder by the ſquare of the denominator; and you will have the fluxion of the fraction required.

Thus, the fluxion of $\frac{x}{y}$ is $= \frac{\dot{x}y - x\dot{y}}{y^2}$

For, putting $z = \frac{x}{y}$; then $yz = x$; and the fluxion of this equation is $\dot{y}z + y\dot{z} = \dot{x}$; therefore, by tranſpoſition $y\dot{z} = \dot{x} - \dot{y}z$, and, by diviſion, $\dot{z} = \frac{\dot{x} - \dot{y}z}{y}$; that is, (by reſtitution, or writing $\frac{x}{y}$ for z its equal), $\dot{z} = \frac{\dot{x} - \dot{y} \times \frac{x}{y}}{y} = \frac{\dot{x}y - x\dot{y}}{y^2} =$ the fluxion of $\frac{x}{y}$.

Hence, the fluxion of x^{-1} is $= -x^{-2}\dot{x}$; the fluxion of x^{-2} is $= -2x^{-3}\dot{x}$; the fluxion of x^{-3} is $= -3x^{-4}\dot{x}$; the fluxion of x^{-4} is $= -4x^{-5}\dot{x}$; &c. And, if m be made to repreſent any negative whole-number, the fluxion of x^m will be $= mx^{m-1}\dot{x}$.

Rule IV. To find the fluxion of an expreſſion compounded of different terms or quantities connected together by the ſigns + and −.

Find the fluxion of each term by the preceding rules; which connect together with the ſigns of the reſpective terms, and you will have the fluxion required.

Thus the fluxion of $ax + y^2 - z$ is $= a\dot{x} + 2y\dot{y} - \dot{z}$. For, putting $ax + y^2 - z = v$; then $ax + y^2 = v + z$: and, it is evident, the ſum of the fluxions of ax and y^2 muſt be equal to the ſum of the fluxions of v and z; that is, $a\dot{x} + 2y\dot{y} = \dot{v} + \dot{z}$; therefore, by tranſ-

transposition, $a\dot{x}+2y\dot{y}-\dot{z}=\dot{v}=$ the fluxion of $ax+y^2-z$.

And, the fluxion of $x-a^2y+xy$ is $=\dot{x}-a^2\dot{y}+\dot{x}y+x\dot{y}$. And, the fluxion of $ax^2+x-\frac{x}{y}$ is $=2ax\dot{x}+\dot{x}-:\frac{\dot{x}y-x\dot{y}}{y^2}$.

Rule V. To find the fluxion of any power of a fluent or flowing quantity; whether the index be integral or fractional, affirmative or negative.

Multiply the whole term by the index of the power; then subtract 1 from the said index, and multiply this whole term by the fluxion of the root of the fluent; and you will have the fluxion of the power required.

Thus, the fluxion of $\overline{x+x^2}|^3$ is $=3\times\overline{x+x^2}|^{3-1}\times\overline{\dot{x}+2x\dot{x}}$, i. e. $=\overline{x+x^2}|^2\times 3\dot{x}+6x\dot{x}$; the fluxion of $\overline{a+x}|^{-2}$ is $=-2\times\overline{a+x}|^{-2-1}\times\dot{x}$, i. e. $=\overline{a+x}|^{-3}\times-2\dot{x}$. And, universally, the fluxion of $x^{\frac{m}{n}}$ is $=\frac{m}{n}\times x^{\frac{m}{n}-1}\times\dot{x}$, i. e. $=\frac{m}{n}x^{\frac{m}{n}-1}\dot{x}$; where, either m or n, or both, may be either integral or fractional, affirmative or negative: so that the index $\frac{m}{n}$, expresses, or represents, any affirmative or negative whole-number or fraction whatsoever.

Rule VI. To find the fluxion of a logarithm.

The fluxion of the hyperbolic logarithm of any quantity, is equal to the fluxion of that quantity, divided by the quantity itself.

Thus, the fluxion of the hyperbolic logarithm of x is $=\frac{\dot{x}}{x}$. The fluxion of the hyperbolic logarithm of $\frac{x}{a+x}$ is $=\frac{\dot{x}}{a+x}$. The fluxion of the hyperbolic logarithm of $\overline{x+\overline{a^2+x^2}^{\frac{1}{2}}}$ is $=\frac{\dot{x}}{\overline{a^2+x^2}^{\frac{1}{2}}}$.

Note, Hitherto we have supposed, when one variable quantity in any fluent increases, that the others, if any, increase likewise: but it often happens that some of them decrease, while the others increase; in which case, the fluxions of the decreasing are negative, with respect to those of the increasing quantities; and therefore, the signs of the terms which are affected with them, ought to be negative.

Thus, if whilst x increases, y decreases; the fluxion of the rectangle xy, will not be expressed by $\dot{x}y+x\dot{y}$, but by $\dot{x}y-x\dot{y}$.

For, let the flowing or variable rectangle A B, (*fig.* 5.) be continually increasing by the parallel motion of the variable line C B moving from the situation A F along the line A E; and, continually diminishing by the motion of the variable line D B, parallel to the line A E, and approaching towards it along the line F A; that is, let the side A C = D B continually increase, while the side A D = C B continually decreases. Now (putting A C = x, and A D = y,) it follows, that the fluxion of the increase will be $=\dot{x}y$, and that the fluxion of the decrease will be $=x\dot{y}$; therefore the fluxion of the decrease, subtracted from the fluxion of the increase, leaves $\dot{x}y-x\dot{y}=$ the fluxion of the rectangle xy; or, the velocity with which it flows.

Understand the same of the fluxion of any fluent of a like nature whatsoever.

Inverse Method of FLUXIONS. See INVERSE.

FLY, in zoology, a large order of insects, the distinguishing characteristic of which is, that their wings are transparent; by this they are distinguished from beetles, butterflies, and grasshoppers.

FLY, in mechanics, a cross with leaden weights at its ends, or rather a heavy wheel at right angles to the axis of a windlas, jack, or the like; by means of which the force of the power, whatever it be, is not only preserved, but equally distributed in all parts of the revolution of the machine.

FLY-BOAT, or FLIGHT, in the Dutch marine, certain merchant-ships of a very clumsy, uncouth built, nearly similar to the genius of the builders: they are generally from four to six hundred tons, and distinguished by a very high stern, like a Gothic turret above, and very broad buttocks below. See BUTTOCK.

FLYERS, in architecture, such stairs as go straight, and do not wind round; nor have the steps made tapering, but the fore and back part of each stair, and the ends, respectively parallel to one another; so that if one flight do not carry you to your intended height, there is a broad half space, from whence you begin to fly again, with steps every where of the same length and breadth as before.

FLYING ARMY, a small body under a lieutenant, or major general, sent to harrass the country, intercept convoys, prevent the enemy's incursions, cover its own garrisons, and keep the enemy in continual alarm.

FLYING-BRIDGE. See the article BRIDGE.

FLYING-CAMP. See the article CAMP.

FLYING FISH, a name given by the English writers to several species of fish, which, by means of their long fins, have a method of keeping themselves out of the water a long time.

FLYING-PINION is part of a clock, having a fly, or fan, whereby to gather air, and so bridle the rapidity of the clock's motion, when the weight descends in the striking part. See the article CLOCK.

FOAL, or COLT, the young of the horse kind. The word colt, among the dealers, is understood of the male kind.

FOCUS, in geometry and conic sections, is applied to certain points in the parabola, wherein the rays

rays reflected from all parts of these curves meet and concur.

The word is Latin, and literally signifies a fire-hearth.

Foci *of an Ellipsis*, are two points, as F *f* (Plate LV. *fig.* 8.) in the longest axis of the ellipsis; from each of which, if any two right-lines are drawn, meeting each other in the periphery of the ellipsis, as *f* N, F N, or *f* L, F L, their sum will be always equal to the longest axis; and therefore, when an ellipsis and its two principal axis are given, and the foci are required, you need only take half of the longest, or transverse axis, in your compasses, and setting one foot in the point where the shortest, or conjugate diameter, cuts the periphery, and the other foot will cut the longest axis in the foci required. See Ellipsis.

Focus *of an Hyperbola* is that point in the axis through which the latus rectum passes. See Conic *Sections* and Hyperbola.

Focus *of a Parabola* is that point in the axis wherein the semi-ordinate is equal to the semi-parameter; or it is that point through which the latus rectum passes. See Conic *Sections* and Parabola.

Focus, in optics, is the point wherein the rays are collected, after they have undergone refraction. See Mirror and Lens.

It is so called because the sun's rays being united within a very small compass or circle, are greatly constipated and condensed; by which means their action or heat is proportionally increased and therefore objects posited in that point will be greatly heated, burnt, or melted.

Virtual Focus, in dioptrics, is the point from which the refracted rays, when they are rendered divergent by refraction, begin to diverge.

FODDER, any kind of meat for horses, or other cattle. In some places, hay and straw, mingled together, is peculiarly denominated fodder.

Fodder, in the civil law, is used for a prerogative that the prince has, to be provided of corn and other meats for his horses, by the subjects, in his warlike expeditions.

Fodder, in mining, a measure containing twenty-two hundred and an half weight, though in London but twenty hundred weight.

FODINA, in anatomy, the labyrinth of the ear. See Ear.

FOECUNDITY, or Fecundity, the same with fertility. See the article Fertility.

FOENUGREEK, *Fœnum-græcum*, in botany, an annual plant, producing trifoliate leaves, placed alternately on a green, slender, hollow stalk, about a foot and a half high. The flowers proceed from the wings of the stalk, and are papilionaceous and white: these are succeeded by long compressed crooked pods, which contain a number of yellowish rhomboidal seeds.

This plant is cultivated in the fields in the south of France, and in Germany. The seeds are used in medicine in cataplasms and fomentations, being emollient and discutient to a great degree. It is also prescribed in carminative and anodyne clysters to abate the acrimony of the humours, and to bestow a mucus on the corroded intestines.

FOETOR, in medicine, stinking or fœtid effluvia, arising from the body, or any part thereof.

FOETUS, in physiology, denotes the child while it is contained in the mother's womb, but particularly after it is formed, till which time it is more properly called embryo. See the article Generation.

FOG, or Mist, a meteor, consisting of gross vapours, floating near the surface of the earth.

FOGAGE, in the forest law, is rank grass not eaten up in summer.

FOIL, among glass-grinders, a sheet of tin, with quicksilver or the like, laid on the backside of a looking-glass, to make it reflect.

Foil, among jewellers, a thin leaf of metal placed under a precious stone, in order to make it look transparent, and give it an agreeable different colour, either deep or pale: thus, if you want a stone to be made of a pale colour, put a foil of that colour under it; or if you would have it deep, lay a dark one under it.

FOLIAGE, among botanists, particularly signifies the leaves of plants; though by some is applied to the petals of a flower. See Leaf and Corolla.

FOLIATING *of Looking-Glasses* is performed by fixing quicksilver on the reverse surface, by means of plates of tin; which amalgamating or combining with the quicksilver, takes away its fluidity, and renders it so tenacious, as to be compressed into a very thin coat or plate, capable of adhering to the surface of the glass.

There are several manners of laying the quicksilver and tin on the glass; and it is by some practised, to use the quicksilver alone; and by others, to compound with it tin and lead; and bismuth has likewise been frequently used instead of them: but it is not necessary, when the operation is well conducted, to make any addition to the quicksilver. The following is one of the best methods hitherto practised.

"A proper number of sheets of thin paper must be procured; which paper should be of a soft spongy nature, like that called blotting paper. This paper must be spread on a table with a very level even surface, and fixed very firmly; or it is better to use a marble table or slab; but so much only of the table should be covered, as may form an area of the same figure with that of the glass to be silvered, a little enlarged. Over the surface of the paper must be sprinkled some powdered chalk; which should be

rolled

rolled or beaten very thin, muſt then be laid upon the paper ſprinkled with chalk, in the moſt ſmooth and even manner: and where there is occaſion, on account of the ſize of the glaſs, to uſe more than one, they ſhould be joined with great exactneſs, rather ſuffering nevertheleſs the edge of one to bear on the other, than leaving any deficiency; ſo that the whole ſurface of the paper may be perfectly covered. Quickſilver is then to be poured upon theſe leaves of tin; and ſpread over every part of it by a hare's foot, or the feathered part of a quill. The ſheets of very thin ſmooth paper, of which the kind called fan paper is beſt, muſt be then laid over the quickſilver, leaving a margin beyond the quickſilver; and upon this paper the glaſs muſt be gently laid: and then, being preſſed down with the one hand, the paper muſt be gently drawn from under it with the other, by taking hold of the margin left for that purpoſe. The upper ſurface of the glaſs muſt then be covered with thicker paper, and a conſiderable weight put over it, in order to preſs out all the quickſilver that is not fixed by the tin; as well as to make it adhere the more firmly to the glaſs. When no more quickſilver appears to drain off, the weights and paper may be removed; and the operation will be complete."

Globes of glaſs may he ſilvered; but as no preſſure can be given, the plates of tin cannot be uſed; and the quickſilver muſt therefore be rendered of a proper conſiſtence, by amalgamating it with ſome of the other metallic ſubſtances. The moſt approved method of doing this is as follows.

"Take of quickſilver two parts, of biſmuth two parts, and of tin and lead each one part. Melt the tin and lead together, and when they are fluid, add the biſmuth; when that is melted likewiſe, take them from the fire, and put the quickſilver gradually to them; ſtirring the mixture till the whole be united. After the maſs is become ſo cool, as not to endanger its breaking the glaſs, pour it into the globe to be ſilvered; uſing a funnel, which will carry it to the bottom of the globe. Move the glaſs then gently about, ſo that the amalgamated matter may flow over every part, and adhere to it; which will effectually ſilver the globe. When every part is covered, pour out the redundant quantity, and keep the glaſs ſtill, till it be perfectly cool. If, during the operation, the mixture is ſet in the globe, and be not ſufficiently liquid to flow about, and cohere with the glaſs, a gentle heat muſt be adminiſtred, which will remedy this defect; and if, on the contrary, the matter appear too fluid, and have not ſufficient tenacity to fix itſelf to the glaſs, it muſt be taken out, and an additional quantity of the biſmuth, tin, and lead, added, by means of a proper heat."

FOLIATION, among botaniſts, ſignifies the complicate or folded ſtate the leaves are in whilſt they remain concealed within the buds of plants.

FOLIO, in merchant books, denotes a page, or rather both the right and left hand pages, theſe being expreſſed by the ſame figure, and correſponding to each other. See BOOK-KEEPING.

FOLIO, among printers and bookſellers, the largeſt form of books, when each ſheet is printed, that it may be bound up in two leaves only.

FOMAHANT, or FOMALHANT, in aſtronomy, a ſtar of the firſt magnitude in Aquarius, whoſe latitude is 29° 19′ 11″ north, and longitude 27° 23′ 24″ of Capricornus, according to Mr. Flamſtead's catalogue.

FOMENTATION, in medicine, the ſame with a liquid epithema, if applied hot; and is the bathing of any part of the body in a proper liquor, commonly made by a decoction of herbs in water, wine, milk, &c. being generally applied by means of ſtupes or doubled flannels, dipped in the medicated decoction, and all the liquor, if very hot, expreſſed out of them, leſt it ſhould ſcald the part, raiſe bliſters, &c. And it is farther obſervable, that a certain degree of heat will diſſolve and diſſipate a rumour, whilſt a higher degree of it will harden and make it ſchirrous.

The word is Latin, *fomentatio*, and derived from *fomento*, to foment.

FONT, among eccleſiaſtical writers, a large baſon, in which water is kept for the baptizing of infants, or other perſons.

It is ſo called probably becauſe baptiſm was uſually performed among the primitive Chriſtians at ſprings or fountains.

FONTANELLA, in anatomy, the quadrangular aperture, between the os frontis and oſſa ſincipitis, in infants juſt born, which is alſo called fons pulſatilis.

FONTICULUS, or FONTANELLA, in ſurgery, an iſſue, ſeton, or ſmall ulcer made in various parts of the body, in order to eliminate the latent corruption out of it. See ISSUE, SETON, &c.

FONTINALIA, in Roman antiquity, a religious feaſt celebrated on October 13, in honour of the nymphs of wells and fountains.

FONTINATIS, in botany, a genus of moſſes. The male flower is almoſt ſeſſile. The antheræ is oblong, with an open mouth, and covered with ſmooth conic calyptræ.

FOOD implies whatever aliments are taken into the body, to nouriſh it. See DIET, DRINK, ALIMENT, &c.

FOOT, *Pes*, a part of the body of moſt animals, whereon they ſtand, walk, &c.

FOOT, in the Latin and Greek poetry, a metre or meaſure, compoſed of a certain number of long and ſhort ſyllables.

FOOT, a longitudinal meaſure; in England it is commonly divided into 12 inches, but by geometricians into 10 digits, and every digit into 10 lines; this latter kind of diviſion is moſtly obſerved in foreign nations: but the foot itſelf differs in length

in different countries; thus the Engliſh foot is to that of Paris as 1000 to 1068; to that of Dantzick as 1000 to 944; to the ancient Greek as 1000 to 1007; to the old Roman as 1000 to 970; and to that of Venice as 1000 to 1162.

FOOT-BANK, or FOOT-STEP, in fortification, the ſame with banquette. See the article BANQUETTE.

FOOT-HUSKS, among botaniſts, ſhort heads, out of which flowers grow.

FOOT-LEVEL, among artificers, an inſtrument that ſerves as a foot-rule, a ſquare, and a level. See the articles LEVEL, RULE, and SQUARE.

FOOT-PACE, or HALF-PACE, among carpenters, a pair of ſtairs, whereon, after four or ſix ſteps, you arrive at a broad place, where you may take two or three paces before you aſcend another ſtep. The deſign of which is to eaſe the legs in aſcending the reſt of the ſteps. See the article STAIR-CASE.

FOOT-ROPES, among ſailors, the ſame with the horſes of the yards. See the article HORSE.

FORAMEN, in anatomy, a name given to ſeveral apertures, or perforations in divers parts of the body; as, 1. The external and internal foramina of the cranium or ſkull, 2. The foramina in the upper and lower jaw. 3. Foramen lachrymale. 4. Foramen membranæ tympani.

FORAMEN OVALE, an oval aperture or paſſage through the heart of a fœtus, which cloſes up after birth.

FORCE *of Bodies in Motion*, or *Moving* FORCE, in phyſics, is that force with which bodies change their place. We do not here mean the ſtroke, preſſure, or action, which cauſes this change of place in a body, but the force which it has while it is moving from one place to another, and may always be known by the effect which it is able to produce, that is by the ſtroke which the moving body can give, or by the reſiſtance or obſtacle which it is able to overcome. It may likewiſe be found mathematically, by multiplying the maſs or quantity of matter contained in any body by its velocity.

The famous diſpute on this ſubject which happened amongſt the philoſophers of the laſt age is of too extraordinary a nature to paſs entirely unnoticed here. It was firſt begun between the celebrated M. Huygens, and the abbot Catalan, about the force of aſcillating bodies; but the aforeſaid abbot, and Mr. Leibnitz, whom we have had occaſion to mention ſo often, were the two firſt who ſeem to have begun the diſpute in earneſt; the latter of theſe gentlemen declaring in expreſs words, that the force of bodies are as their maſſes multiplied by the ſquare of their velocities. He was anſwered by Catalan, and afterwards by Mr. Papin; he replied, and was replied to again; till at laſt one ſide or other was joined by all the philoſophers in Europe: however, Leibnitz and his party proved too weak to withſtand the arguments of the other, backed by the Newtonion method of philoſophizing, which depends only on facts and experiments: to counter-balance which, their opponents had recourſe to critical diſtinctions, and metaphyſical ſubtleties, to evade the force of their arguments, explaining and re-explaining, till at length they ſeem to have explained away their own meaning, if they might be ſaid to have any at firſt. To ſay the truth, the diſpute ſeems to have been occaſioned by a miſtake, and continued through a miſunderſtanding, whether a wilful one or not we cannot take upon ourſelves to ſay; for when we ſay that the force of bodies in motion is as their velocity multiplied into their maſs, we underſtand the action of thoſe bodies to be inſtantaneous, for if time be taken into the conſideration, the effects will be very different, and in ſome caſes, when the action is applied to ſoft or yielding bodies, will approach very nearly to the ſquares of the velocities multiplied into the maſs; as was aſſerted by Mr. Leibnitz and his followers.

Attractive FORCE. See ATTRACTION.

Central FORCE. See CENTRAL *Force.*

Centrifugal FORCE. See CENTRIFUGAL *Force.*

Centripetal FORCE. See CENTRIPETAL *Force.*

FORCE *of the Heart.* See HEART.

FORCE *of the Wind.* See ANEMOMETER.

FORCE, in law, ſignifies any unlawful violence offered to things or perſons.

FORCEPS, in ſurgery, &c. an inſtrument that is well known, of which there are ſeveral ſorts, adapted to various operations. Their uſes are to lay hold of any thing and extract it from the body.

FORCER, or FORCING-PUMP, in mechanics, is a kind of pump in which there is a forcer or piſton, without a valve. See PUMP.

FORCIBLE, in law, ſomething done illegally. See the article FORCE.

FORCING, among gardeners, the raiſing of cucumbers, melons, ſtrawberries, &c. on common hot-beds; alſo the producing ripe fruit from ſeveral ſorts of trees before their uſual ſeaſon. Peaches, nectarines, cherries, and grapes, being the moſt valuable and admired wall-fruits, the common method of forcing them is as follows: The trees deſigned to be forced ſhould be in good condition, with a good quantity of blowing wood; theſe ſhould be covered with moveable glaſſes ſloping from the top of the wall to about four feet and a half from the bottom, and cloſed at each end, theſe may be put on in February, as early forcing is liable to miſcarriage: on the north ſide of the wall there ſhould be a quantity of new horſe-dung, placed ſloping as the glaſſes on the other ſide, but wider; this will throw a conſiderable heat through the wall (which ſhould not be too thick) and thereby cauſe (with the aid of the ſun in front) the bloſſoms and leaves to come out quickly: when the heat of the dung is much abated, it may be neceſſary to remove it, and

and lay a freſh quantity in its ſtead. When the trees are in full flower, they ſhould have a conſiderable ſhare of air at all favourable opportunities, otherwiſe the bloſſoms will fall off, and, conſequently, the crop miſcarry; alſo it will be neceſſary to give the roots frequent refreſhings of water, as likewiſe the branches, but this muſt be done in the morning, when there is an appearance of a ſunny day.

But we think the following method of forcing preferable to the former; this is practiſed in Holland, and lately introduced in a few gardens in England, particularly at the earl of Ancram's, at Charlton in Kent, where they force peaches and nectarines in very great perfection without detriment to the trees. To give the reader a proper idea of the forcing-frame, we have exhibited in Plate LV. *fig.* 7, a ſketch in perſpective (the front end is the ſection) of one which contains two trees, and may be continued to any length at pleaſure: the line *a* is the ſurface of the ground; *b* is the pit filled with new tan, which heats the frame; *c* is the ſpace left to go in to manage the under part of the tree, and to gather the under fruit, which are almoſt as numerous as thoſe on the upper-ſide; *d* is a lattice-work to train the trees on, at about ten inches below the glaſſes *f*. The roots of the trees are partly within the frame and partly without, extending within as far as the tan-bed *b*, the bottom of the ſtem being juſt within the lower part of the frame at *g*. The lights or glaſſes may be about four feet and a half or five feet wide, and ſix feet and a half long; each of which will contain a middling ſized tree. It may aſked how a tree can properly be planted to form the direction here deſcribed (which may make an angle of about forty degrees with the horizon); in anſwer to which, it is to be ſuppoſed that the tree has previouſly been trained againſt a wall, and conſequently the major part of the roots have a direction but one way; therefore in planting the tree to force in this ſort of a frame, it is only reverſing it, that is, the ſide which was next the wall will be uppermoſt in the frame, and the roots downward, which will be of no detriment to it. The management, &c. is much the ſame as the former method of forcing; but, for the benefit of thoſe who have an inclination to early raiſed fruits, we would by all means recommend this laſt form; and at the ſame time we cannot but diſapprove of thoſe forcing frames which have a fleue in the wall, as it is ſo very drying, that few trees eſcape being peſtered with a multitude of inſects, which prey on them ſo much as finally to be their utter deſtruction, unleſs an almoſt continual waſhing the leaves and branches prevents it.

FORCING *of Wine*. See WINE.

FORE-CASTLE, in ſhip-building, a ſhort deck which reaches from the top of the ſtem to the after part of the fore-ſhrouds; or it commonly reaches as far behind, or abaft, the fore-maſt, as it is from the maſt to the upper part of the ſtem.

FORE-CLOSED, in law, ſignifies the being ſhut out, and excluded, or barred, the equity of redemption on mortgages, &c.

FORE-FOOT, in ſhip-building, a piece of crooked timber, the lower part of which is bolted to the fore-end of the keel, of which it is a part, and the upper part laid on and bolted to the foot of the ſtem, of which it is alſo a part. See this fully explained in the article SHIP-BUILDING.

FORE-JUDGED, in law, ſignifies a judgment, whereby one is deprived, or put by a thing in queſtion.

FORELAND, in the ſea-language, the ſame with a cape. See the article CAPE.

FORELAND, in fortification, the ſame with lizière. See the article LIZIERE.

FORE-LOCKS, little wedges of iron thruſt to the ends of the bolts in a ſhip's ſide, to prevent them from drawing as the ſhips labours at ſea.

FORELORN-*Hope*, in the military art, ſignifies men detached from ſeveral regiments, or otherwiſe appointed, to make the firſt attack in day of battle; or at a ſiege, to ſtorm the counterſcarp, mount the breach, or the like.

They are ſo called from the great danger they are unavoidably expoſed to; but the word is old, and begins to be obſolete.

FORE-MAST. See the article MAST.

FORE-REACHING, or, in the ſea-language, the act of making a greater progreſs forward than another ſhip; as the Tartar fore-reaches on the Eagle, i. e. advances quicker, or gains ground of her.

FORE-SKIN, in anatomy, the ſame with prepuce. See the article PREPUCE.

FOREST, *Sylva*, in general, a great wood, or a large extent of ground covered with trees.

FORE-STAFF, or CROSS-STAFF, a mathematical inſtrument uſed to take the ſun's altitude.

FORESTALLER, a perſon who is guilty of foreſtalling.

FORESTALLING, in law, buying or bargaining for any corn, cattle, victuals, or merchandize, in the way as they come to fairs or markets to be ſold, before they get thither, with an intent to ſell the ſame again at a higher price.

FORESTER, a ſworn officer of the foreſt, appointed by the king's letters patent, to walk the foreſt at all hours, watch over the vert and veniſon; alſo to make attachments and true preſentments of all treſpaſſes committed within the foreſt.

FORE-TOP-MAST. See the article TOP-MAST.

FORFEITURE, properly ſignifies the effect of tranſgreſſing ſome penal law, and extends to lands or goods.

Forfeiture differs from confiſcation, in that the former is more general, whilſt confiſcation is parti-

cularly applied to such things as become forfeited to the king's exchequer; and goods confiscated, are said to be such as no person claims.

FOREFIELD, among miners, the fartheſt place of a meer of ground.

FORGE, properly ſignifies a little furnace, wherein ſmiths, and other artificers of iron or ſteel, &c. heat their metals red hot, in order to ſoften and render them more malleable and manageable on the anvil.

FORGERY, in a legal ſenſe, is where a perſon fraudulently makes and publiſhes falſe writings to another's prejudice: or, it ſignifies the writ that lies againſt him who offends that way.

FORGING, in ſmithery, the beating or hammering iron on the anvil, after having firſt made it red hot in the forge, in order to extend it into various forms, and faſhion it into works.

FORM, *forma*, in phyſics, the eſſential or diſtinguiſhing modification of the matter whereof a natural body is compoſed, ſo as thereby to give it ſuch a particular manner of exiſtence, being that which conſtitutes it ſuch a particular body, and diſtinguiſhes it from every other body.

FORMS *of Syllogiſms*, or *Syllogiſtic* FORM, among logicians, a juſt diſpoſition both of the terms, in reſpect of predicate and ſubject; and of the propoſitions, in reſpect of quantity and quality: by which is only meant a diſpoſition wherein the concluſion follows duly and legitimately from the two premiſes; there being no form where there is no concluſion. See the article SYLLOGISM.

FORM, in theology, is ſaid to be one of the eſſential parts of the ſacraments; being that which gives them their ſacramental nature and efficacy, and conſiſting in certain words, which the prieſt pronounces in adminiſtering them.

FORM is alſo uſed in a moral ſenſe, for the manner of being, or doing a thing according to rules; thus we ſay, a form of government, a form of argument, &c.

FORM, in law, the rules eſtabliſhed and requiſite to be obſerved in legal proceedings.

FORM, in carpentry, is uſed to denote the long ſeats or benches in the choirs of churches, or in ſchools, for the prieſts, prebendaries, religious, or ſcholars, to ſit on.

At ſchools, the word form is frequently applied to what is otherwiſe termed a claſs. See CLASS.

FORM alſo denotes the external appearance or ſurface of a body, or the diſpoſition of its parts, as to the length, breadth, and thickneſs. See the article FIGURE.

FORM is alſo uſed among mechanics, for a ſort of mould, whereon any thing is faſhioned or wrought; as the hatter's form, the paper-maker's form, &c. See the article HATTER, &c.

Printer's FORM, an aſſemblage of letters, words, and lines, ranged in order, and ſo diſpoſed into pages by the compoſitor, from which, by means of ink and a preſs, the printed ſheets are drawn.

Every form is incloſed in an iron chaſe, wherein it is firmly locked by a number of pieces of wood; ſome long and narrow, and others of the form of wedges. See PRINTING.

FORMA PAUPERIS, in law, is where a perſon has juſt cauſe of ſuit, but is ſo poor that he cannot defray the uſual charges of ſuing at law or in equity; in which caſe, on making oath that he is not worth five pounds in the world, on all his debts being paid, and producing a certificate from ſome lawyer that he has good cauſe of ſuit, the judge will admit him to ſue in forma pauperis; that is, without paying any fee to counſellors, attorneys, clerks, &c.

FORMATION, in philoſophy, an act whereby ſomething is formed or produced.

FORMATION, in grammar, ſignifies the manner of forming one word from another; thus accountantſhip is formed from accountant, and this laſt from account.

FORMERS, in gunnery, round pieces of wood, fitted to the diameter of the bore of a gun, chiefly uſed for making cartridges.

On theſe formers, the paper, parchment, or cotton, which is to make the cartridge, are rolled before it be ſewed.

FORMICA, the ant, in zoology. See the article ANT.

FORMICA-LEO, the ant-lion, or ant-eater, in zoology, an inſect ſo called from its devouring great numbers of ants. It is the caterpillar or worm of a fly, much reſembling the libellæ, or dragon-flies.

FORMING *the line*, in naval affairs, drawing up the ſhips of a ſquadron or diviſion in a ſtrait line, about an hundred and twenty fathoms diſtant from each other. See the article LINE *of Battle*.

FORMULA, or FORMULARY, a rule or model, or certain terms preſcribed or agreed by authority, for the form and manner of an act, inſtrument, proceeding, or the like.

FORMULA, in medicine, imports the conſtitution of medicines, either ſimple or compound, both with reſpect to their preſcription and conſiſtence. Paracelſus calls red and clear urine, formula urinæ.

FORNICATION, the act of incontinency between ſingle perſons; for when either of the parties is married, ſuch act is adultery. See ADULTERY.

FORNIX, in anatomy, a part of the brain placed under the ſeptum lucidum, and, like it, compoſed of a medullary ſubſtance. Its anterior part riſes with a double baſe, but the two parts ſoon unite: the hinder part is likewiſe bifid, and thence called crura fornicis, and by ſome, pedes hippocampi. See the article BRAIN.

FORRAGE, in the military art, denotes hay, oats, barley, wheat, graſs, clover, &c. brought into the camp by the troopers, for the ſuſtenance of their horſes.

Dry

Dry forage is the hay, oats, &c. delivered out of the magazines, to an army in garrison, or when they take the field, before the green forage is sufficiently grown up to supply the troops.

FORT, in the military art, a small fortified place, environed on all sides with a moat, rampart, and parapet. Its use is to secure some high ground, or the passage of a river, to make good an advantageous post, to defend the lines and quarters of a siege, &c.

Forts are made of different figures and extents, according as the ground requires. Some are fortified with bastions, others with demi-bastions. Some again are in form of a square, others of a pentagon. A fort differs from a citadel, as this last is built to command some town. See the article CITADEL.

Royal-FORT, one whose line of defence is at least twenty-six fathoms long.

Star-FORT, a redoubt formed by a number of re-entering and saliant angles, the sides of which flank each other.

FORTIFICATION, the art of fortifying a town, or other place; or of putting them in such a posture of defence, that every one of its parts defends, and is defended by some other parts, by means of ramparts, parapets, moats, and other bulwarks; to the end, that a small number of men within may be able to defend themselves for a considerable time against the assaults of a numerous army without, so that the enemy, in attacking them, must of necessity, suffer great loss.

Fortification is either ancient or modern, regular or irregular. Ancient fortification, at first, consisted of walls or defences made of trunks, and other branches of trees, mixed with earth, to secure them against the attacks of the enemy. This was afterwards altered to stone-walls, on which were raised breast-works, behind which they made use of their darts and arrows in security. Modern fortification, is that which is flanked and defended by bastions and out-works, the ramparts of which are so solid, that they cannot be beat down but by the continual fire of several batteries of cannon.

Regular fortification, is that built in a regular polygon, the sides and angles of which are all equal, being commonly about a musket-shot from each other.

Irregular fortification, on the contrary, is that where the sides and angles are not uniform, equidistant, or equal; which is owing to the irregularity of the ground, valleys, rivers, hills, and the like.

The principal maxims of fortification are these: 1. That every part of the works be seen and defended by other parts, so that the enemy can lodge no where without being exposed to the fire of the place. 2. A fortress should command all places round it; and therefore all the out-works ought to be lower than the body of the place. 3. The works farthest from the center, ought always to be open to those more near. 4. No line of defence should exceed a point-blank musket-shot, which is about an hundred and twenty, or an hundred and twenty-five, fathoms. 5. The more acute the angle at the center is, the stronger will be the place. 6. In great places, dry trenches are preferable to those filled with water, because sallies, retreats, and succours are frequently necessary; but, in small fortresses, water-trenches, that cannot be drained, are best, as standing in need of no sallies, &c.

Marine FORTIFICATIONS. Though these have nothing peculiar in them, yet it may not be improper to give some directions with relation to batteries. 1. In raising batteries to hinder a descent, care should be taken to dispose them in such places where the descent is most easy; and the guns should be so levelled as to scour the surface of the water, that they may fire effectually upon the boats as they approach. 2. It is likewise convenient to have batteries to play upon places where there is good anchorage; and these should be somewhat more elevated than the former. 3. It is also necessary to erect batteries at the entrance of roads; and these ought to be so made, as to discover ships at a distance. 4. It is very necessary that these batteries should be defended by some works, against attacks; and, if possible, should be under the fire of the place; or, at least, they ought not to be too far advanced.

FORTIN, FORTLET, or *Field*-FORT, a sconce or little fort, whose flanked angles are generally distant one from another an hundred and twenty fathoms.

FORTISSIMO, in music, sometimes denoted by FFF, or *fff*, signifies to sing or play very loud or strong.

FORTUNE, *Fortuna*, a goddess worshipped with great devotion by the ancient Greeks and Romans, who believed her to preside over human affairs, and to distribute wealth and honour at her pleasure.

FORUM, in Roman antiquity, a public standing place within the city of Rome, where causes were judicially tried, and orations delivered to the people.

FOSS, or FOSSA, in anatomy, a kind of cavity in a bone, with a large aperture, but no exit or perforation.

Foss is particularly used for the cavity, or indenture, in the back part of the neck.

FOSSA MAGNA, the interior cavity, or rima magna, of the pudendum muliebre. Bartholin calls it fossa navicularis.

FOSS, in fortification, a hollow place, commonly full of water, lying between the scarp and counterscarp, below the rampart; and turning round a fortified place or a post that is to be defended. See MOAT.

FOSS-WAY, one of the four principal high-ways of

of England, that anciently led through the kingdom; ſuppoſed to be made by the Romans, having a ditch upon one ſide thereof.

FOSSIL, in natural hiſtory, denotes, in general, every thing dug out of the earth, whether they be natives thereof, as metals, ſtones, ſalts, earths, and other minerals; or extraneous, repoſited in the bowels of the earth by ſome extraordinary means, as earthquakes, the deluge, &c.

FOVEA CORDIS, in anatomy, the pit of the heart, or rather of the ſtomach.

FOUGADE, or FOUGASSE, in the art of war, a little mine, about eight or ten feet wide, and ten or twelve deep, dug under ſome work or poſt, which is in danger of falling into the enemy's hands, and charged with ſacks of powder, covered with ſtones, earth, and whatever elſe can make great deſtruction. It is ſet on fire like other mines, with a ſauciſſe.

FOUL, in the ſea-language, entangled or embarraſſed: foul anchor, i. e. an anchor which has either hooked its own or ſome other cable, wreck, rocks, &c. "a ſhip ran foul of us in the night," i. e. came cloſe to our ſhip, entangling herſelf amonſt our rigging.

FOUL-BOTTOM is when the bottom of a ſhip is covered with ooze, graſs, ſhells, or other excrements.

FOUL-HAWSE is when the ſhip, being moored by two anchors, has turned round, and conſequently twiſted one cable about the other.

FOUL-WIND, a wind which blows contrary to the ſhip's courſe.

FOULNESS, in ſurgery, a term applied to wounds, where the fleſh is putrid, fungous, black, or livid.

FOUNDATION, in architecture, is that part of a building which is under-ground.

Foundations are either natural or artificial. Natural, as when a building is erected upon a rock, or very ſolid earth, in which caſe we need not ſeek for any farther ſtrengthening; for theſe, without digging, or other artificial helps, are of themſelves fit to uphold the greateſt buildings. But if the ground be ſandy, or marſhy, or hath lately been dug, recourſe muſt be had to art. If the ground be ſandy or marſhy, you muſt dig till you find ſound ground, and the beſt is that which requires moſt labour in cutting, and when wet does not diſſolve into dirt. If the earth to be built upon is very ſoft, as in mooriſh grounds, lay good pieces of oak, whoſe length muſt be about the breadth of the trench, or two feet longer than the breadth of the wall, acroſs the foundation, about two feet aſunder, and being well rammed down, lay long planks upon them, pinning or ſpiking down each plank to the pieces of oak on which it lies. But if the ground be very bad, let piles of oak, of a diameter about one-twelfth part of their length, be drove down to reach the good ground, and placed as cloſe as one can ſtand by another; then ſpike down long planks upon them. And it muſt not be forgot to place the piles, not only under the outer walls, but alſo under the inner walls that divide the building; for if theſe ſhould ſink, it would make the outer wall crack, and ſo ruin the whole building. If the ground be faulty here and there, let arches be turned over the faulty places, which will diſcharge them of the weight. As to the rules neceſſary to be obſerved in the ſubſtruction or artificial part of the foundation, they are theſe: 1. That the bottom of the trench be made exactly level. 2. That the loweſt ledge or row be all of ſtone (the broader the better) laid cloſe together. 3. That the breadth of the ground-work be at leaſt double that of the wall to be raiſed on it. However, the breadth may be regulated according to the goodneſs of the ground, and the weight of the intended edifice. 4. That the foundation be made to diminiſh as it riſes, taking care, however, that it do ſo equally on both ſides. 5. That you ought never to build on the ruins of an old foundation, unleſs well aſſured of its depth and ſtrength to bear the ſuperſtructure. 6. And laſtly, The ſtones in a foundation ſhould be laid as they naturally lay in the quarry; a precept generally obſerved by all good architects, becauſe they find the ſtones are ſubject to cleave that way of the grain that lay horizontally in the quarry. In ſome places buildings near the water are founded on ſacks of wool laid like matreſſes, which being well preſſed and greaſy, will never give way, nor rot in the water.

FOUNDATION *of Bridges* is laid after different manners. The firſt is by incloſing all the round ſpace of ground you would build upon, by dams made with piles ſet deep in the ground in double rows, well ſtrengthened and bound together with croſs pieces and cords, and filling the vacant ſpaces between them with chalk or other earthy matter. This being done, the water muſt be emptied out, and the foundation dug according to the quality of the ground, driving down piles, if it be neceſſary, upon which the walls of the foundation muſt be laid. But this method is only practicable in building on ſuch rivers, where the water is neither very rapid, nor very deep. The ſecond is done by laying the foundation on grate-work, rafts of ſtout oak well bound together, and made faſt at the ſurface of the water with cables or machines, and building upon them large quarters of ſtone, cramped together, and joined with good mortar, or cement, and afterwards letting them deſcend ſoftly by theſe cables and machines perpendicularly to the bottom of the water. This was the method practiſed in laying the foundation of Weſtminſter bridge, the grating being made of the bottom of a frame called by the French *caiſſon*, the ſides of which were ſo contrived that they might be taken off, after a pier was finiſhed.

ed. The third is by drawing off all, or the greateſt part of the water of the river into ſome other place; and this was done at London-Bridge, if we could believe Stow, who alledges, that during the time of building, the river was turned from Batterſea to Rotherhith; but this is not warranted.

FOUNDATION denotes alſo a donation or legacy either in money or lands, for the maintenance and ſupport of ſome community, hoſpital, ſchool, lecture, &c.

FOUNDAY, in metallurgy, a term uſed by the workers at the iron-mines in many counties in England, for the ſpace of ſix days, in which time they continue to make a determinate quantity of iron; ſo that they count their work by theſe foundays, or weeks.

FOUNDER, in a general ſenſe, the perſon who lays a foundation, or endows a church, ſchool, religious houſe, or other charitable inſtitution. The founder of a church may preſerve to himſelf the right of patronage, or preſentation to the living.

FOUNDER alſo implies an artiſt who caſts metals, in various forms, for different uſes, as guns, bells, ſtatues, printing characters, candleſticks, buckles, &c. whence they are denominated gun-founders, bell-founders, figure-founders, letter-founders, founders of ſmall works, &c. See FOUNDERY.

FOUNDER, in glaſs-making, a term appropriated to the crown and green glaſs, and is the perſon there, who in the ſame office in the white glaſs making is called conciator.

FOUNDERING, in the menage, a diſorder in horſes, of which there are two kinds, viz. in the feet and in the cheſt.

Foundering in the feet, is an univerſal rheumatiſm, or defluction of humours upon the ſinews of a horſe's feet, which cauſes ſo great a ſtiffneſs in the hoofs, that the horſe has no ſenſe or feeling of them.

This diſorder ariſes from hard riding; from great heats and colds; and is ſometimes occaſioned by watering a horſe when he is very hot, by which means, as the farriers term it, his greaſe is melted within him; alſo by wearing too ſtreight a ſhoe, or travelling upon hard ground.

The general methods of curing this diſtemper are, firſt to pare all the horſe's ſoles ſo thin, that you may ſee the quick: then bleed him well at every toe; ſtop the vein with tallow and roſin; and having tacked hollow ſhoes on his feet, ſtop them with bran, tar, and tallow, as boiling hot as may be; and this renew once in two days for a week together, after which, let him have good exerciſe, &c. or, after he is pared thin, and let blood at his toes, ſtop his feet with cow's dung, kitchen-fee, tar, and ſoot, boiled together, and poured boiling-hot into them.

Foundering in the cheſt may proceed from crudities in the ſtomach, or other infirmities, obſtructing the paſſages of the lungs; and may be diſcovered by the horſe's not being able to bow his joints; and being once laid, he cannot riſe again; his legs ſwell, &c.

As a particular remedy for cheſt-foundering, take five or ſix pennyworth of oil of peter, and mingle it with an equal quantity of ale, or beer: then rub this mixture with your hand on the part affected; and cauſe a red-hot fire-ſhovel to be held before it during the application.

FOUNDERING, among ſailors, ſinking in a ſtorm at ſea.

FOUNDERY, or FOUNDRY, the art of caſting all ſorts of metals, into different forms. It likewiſe ſignifies the work-houſe, or ſmelting-hut, wherein theſe operations are performed.

FOUNT, or FONT, among printers, a ſet or quantity of letters, and all the appendages belonging thereto, as numeral characters, quadrates, points, &c. caſt by a letter-founder, and ſorted.

FOUNTAIN, *Fons*, a ſpring of living water that riſes out of the ground. See SPRING.

Fountains or ſources of rivers were held ſacred among the ancients, and even worſhipped as a kind of divinity: and it was a point of religion, not to muddy the waters in bathing.

Artificial FOUNTAIN, or *jet d'eau*, a contrivance, whereby water is violently ſpouted upwards.

Some fountains are founded on the elaſticity of the air, and others on the preſſure of the water.

The artificial fountain (*fig.* 9.) which may be ſet up upon either of its ends, after it has played out all its water in a jet through the ſpouting-pipe E, plays again afreſh through the ſpout I, when you have turned it over like an hour-glaſs. The water contained in the cavity A F H runs down the curve pipe C D E, and ſpouts up through the jet E by the preſſure of the column of water C D. But, unleſs the pipe G F was open at G, to let the air run up to F, and preſs at top of the ſurface of the water in the cavity A, the water could not run down and ſpout at E. There is ſuch another pipe as G F at K, belonging to the cavity B, through which the water of the jet received in the baſon ſupplies the cavity B, whilſt the fountain ſtands on the end B: but, when the fountain is inverted, it ſupplies B with air to let the water deſcend in the direction G H I, I becoming the ſpouting pipe.

Upon theſe principles depend alſo the alternate running and ſtopping of the fountain at command (*fig.* 10.) C A E is a receptacle of water cloſe from the air's entrance, except through the pipe G F, when the cock C, by which it was filled, is ſtopped. There is another pipe E D H B, which goes from the bottom of the water to the jet B in the baſon D B, but is ſtopped by the cock H. At the loweſt part of the baſon D B there is a ſmall hole at I to let the water of the baſon D B run into the baſon,

baſon G H under it: there is alſo a ſmall triangular hole or notch in the bottom of the pipe F G at G. Turn the cock H, and the fountain will play ſome time; then ſtop, then play again alternately. The cauſe of playing and ſtopping is this; the water coming down the pipe E D H B would not come out at B, if the S *s* above the water were not ſupplied, as it dilated: now it is ſupplied by the pipe G F, which takes it in at the notch G, and delivers it out at F; but after ſome time the water which has ſpouted out at B, falling down into the baſon D B, riſes high enough to come above the notch G, which ſtops the paſſage of the air, ſo that the air S *s* above the water in the veſſel C A E cannot ſufficiently preſs for want of a ſupply, and the fountain ceaſes playing. Now the water of D B runs down into the lower baſon H G, through the hole I, till it falls below the top of the notch G, and then the air runs up into the upper receptacle again, and ſupplying the air at S *s*, the fountain plays again. This is ſeen a little before-hand by a ſkin of water on the notch G, before the air finds paſſage, and then you command the fountain to play. The hole I muſt be leſs than that of the jet, otherwiſe the water will all run out into the lower baſon, without riſing high enough to ſtop the notch G.

In the next fountain A B (*fig.* 11.) the air is condenſed at the top of the water by means of a ſyringe, ſometimes by blowing in; and the air and water are retained by the cock C, which muſt be opened, before it can play; then the water, ſtrongly preſſed by the condenſed air at S S, goes through the pipe *o* and the adjutage *b* with great force, in jets of ſeveral figures according to the ſpouting-pipes put on at *b*.

In the fountain (*fig.* 12.) the air, being compreſſed by the concealed fall of waters, makes a jet, which ſeen for a while is looked upon as a perpetual motion by the ignorant.

The boxes C E and D Y X being cloſe, you only ſee the baſon A B W, with a hole at W, into which the water ſpouting out at B falls; but that water, going down the hole W, does not come up again at W, but runs down through the pipe W X into the box D Y X, from whence it drives out the air through the aſcending pipe Y Z into the cavity of the box C E, where, preſſing upon the water that is in it, it forces it out through the ſpouting-pipe O B, as long as there is any water in C E: ſo that this whole play is only whilſt the water contained in C E, having ſpouted out, falls down through the pipe W X into the cavity D Y X. The force of the jet is proportional to the height of the pipe W X, or of the boxes C E and D Y X above each other, The height of the water, meaſured from the baſon A B W to the ſurface of the water in the lower box D Y X, is always equal to the height meaſured from the top of the jet to the ſurface of the water in the middle cavity at C E. Now ſince the ſurface C E is always falling, and the water in D Y always riſing, the height of the jet muſt continually decreaſe, till it is ſhorter by the height of the depth of the cavity C E, which is emptying, added to the depth of the cavity D Y, which is always filling; and, when the jet is fallen ſo low, it immediately gives over. In the figure the air is repreſented by points.

To prepare this fountain, which is generally done privately firſt, pour in water at W, till the cavity D X Y be full; then turn the fountain over, and the water will run from the cavity D X Y into the cavity C E, which is full, when the water runs out at B held down, Set the fountain up again as if nothing had been done to it. When you would make it play, pour in about a pint of water into the baſon A B W, and when the pipe W X is filled, the fountain will play, and continue ſo to do, as long as there is water in C E. You may pour the water left in the baſon A B W into any veſſel, and invert the fountain, which, when ſet upright, will be ſet a playing by putting back the water poured out into A B W; and ſo *toties quoties*.

FOURCHEE, or FOURCHY, in heraldry, an appellation given to a croſs forked at the ends.

FOURCHER, or FOURCHING, in law, ſignifies the delaying or putting off an action, which might have been brought to a determination in a ſhorter time.

FOURTH, in muſic, one of the harmonic intervals. It conſiſts in the mixture of two ſounds, which are in the ratio of 4 to 3; that is, of ſounds produced by chords, whoſe lengths are to each other as 4 to 3.

FOWL, among zoologiſts, denotes the larger ſort of birds, whether domeſtic or wild: ſuch are geeſe, pheaſants, partridges, turkies, ducks, &c.

FOX, *Vulpes*, in zoology, an animal of the dog-kind, which much reſembles the common dog in form, and is of the ſize of a ſpaniel: it is chiefly diſtinguiſhed by its long and ſtraight tail, with the tip white.

The fox is a native of moſt northern countries. That of Siberia is about the ſize of a common kind; but its head is larger, and its tail not only bigger and more buſhy, but all of one colour.

FOX-GLOVE, *Digitalis*, in botany, See DIGITALIS.

FRACHES, in glaſs-making, flat iron pans, wherein the new-made veſſels are put, to be removed gradually from the fire.

FRACTION, in arithmetic, or, as it is ſometimes called, a BROKEN NUMBER, is that which repreſents a part or parts of any thing propoſed, and is generally expreſſed by two numbers placed one above the other, with a line drawn between them:

Thus $\left\{\begin{array}{l}\frac{3}{4}\end{array}\right.$ $\begin{array}{l}3 \text{ is the numerator,}\\ 4 \text{ is the denominator,}\end{array}$

The denominator denoting how many parts the thing

thing or unity is supposed to be divided into, and the numerator shews how many of these parts are contained in the fraction.

Again, fractions are of three sorts, that is, vulgar, decimal, and algebraical, or literal.

1st. Decimal fractions, which is the most elegant and natural way of dividing unity, always supposes the integer divided into 10, 100, 1000, &c. accordingly as precisenes in the operation is required: hence the denominator being known, needs not be expressed, but the fraction may be set down in the same manner as a whole number, only taking care to prefix its distinguishing point, or comma; so $\frac{5}{10}$ will be expressed by ,5, $\frac{5}{100}$ by ,05, and $\frac{75}{100}$ by ,75, &c.

2d. Vulgar fractions are of three sorts, viz. simple or proper, improper, and compound: a simple, or proper fraction hath its numerator always less than its denominator, and consequently the value of the fraction is always less than unity, as $\frac{1}{4}$, $\frac{11}{15}$, $\frac{25}{739}$, &c.

An improper fraction is that whose numerator is greater than the denominator; as, $\frac{5}{4}$, $\frac{109}{10}$, $\frac{3460}{100}$, &c.

A compound fraction is one which has more numerators and denominators than one, and may always be distinguished by the word *of* being put between them, as $\frac{2}{3}$ of $\frac{1}{2}$, $\frac{3}{4}$ of $\frac{6}{10}$ of $\frac{9}{123}$, &c. The formation of these fractions is easy, for 7 pence is easily known to be $\frac{7}{12}$ of a shilling; and one shilling is $\frac{1}{20}$ of a pound; therefore 7 pence is $\frac{7}{12}$ of $\frac{1}{20}$ of a pound. Numberless other examples might be given, but we apprehend the following will be sufficient to shew the nature of them.

All compound fractions are reduced to single ones, by the following

Rule.—Multiply all the numerators into one another for a numerator, and all the denominators into one another for the denominator.

Thus the $\frac{1}{3}$ of $\frac{2}{3}$ of $\frac{2}{3}$ will become $\frac{6}{60}$, or $\frac{1}{10}$.

For $1 \times 3 \times 2 = 6$, the numerator, and $3 \times 4 \times 5 = 60$, the denominator.

To alter or change different FRACTIONS *into one denomination retaining the same value.*—In order to gain a clear understanding of this proposition, it will be convenient to premise this lemma, viz. If a number multiplying two numbers produce other numbers, the numbers produced of them shall be in the same proportion that the numbers multiplied are.

That is, if both the numerator and denominator of any fraction be equally multiplied into another number, their products will retain the same value with that fraction.

As in these $\frac{2}{3} \times \frac{2}{2} = \frac{4}{6}$. Or, $\frac{2}{3} \times \frac{3}{3} = \frac{6}{9}$. Or, $\frac{2}{3} \times \frac{5}{5} = \frac{10}{15}$, &c.

That is, $\frac{2}{3}$ and $\frac{4}{6}$, or $\frac{2}{3}$ and $\frac{6}{9}$, or $\frac{2}{3}$ and $\frac{10}{15}$, are of the same value in respect to the whole or unit.

From hence it will be easy to conceive, how two or more fractions, that are of different denominations, may be altered or changed into others that shall have one common denominator, and still retain the same value.

Example.—Let it be required to change $\frac{2}{3}$ and $\frac{3}{7}$ into two other fractions that shall have one common denominator, and yet retain the same value.

According to the foregoing lemma, if $\frac{2}{3}$ be equally multiplied by 7, it will become $\frac{14}{21}$, viz. $\frac{2}{3} \times \frac{7}{7} = \frac{14}{21}$. Again, if $\frac{3}{7}$ be multiplied equally with 3, it will become $\frac{9}{21}$, viz. $\frac{3}{7} \times \frac{3}{3} = \frac{9}{21}$. And by this means we have obtained two new fractions, $\frac{14}{21}$ and $\frac{9}{21}$, that are of one denomination, and the same value with the two first proposed, viz. $\frac{14}{21} = \frac{2}{3}$, and $\frac{9}{21} = \frac{3}{7}$. And from hence arises the general rule for bringing all fractions into one denomination.

Rule.—Multiply all the denominators into each other for a new and common denominator; and each numerator into all the denominators except its own, for new numerators.

Example.—Let the proposed fractions be $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$, and $\frac{6}{7}$.

Then $3 \times 5 \times 4 \times 7 = 420$, the new and common denominator: also $1 \times 5 \times 4 \times 7 = 140$, $2 \times 3 \times 4 \times 7 = 168$, $3 \times 3 \times 5 \times 7 = 315$, and $6 \times 3 \times 5 \times 4 = 360$, the new numerators. Hence 420 is the common denominator; and 140, 168, 315, 360, are the new numerators; and, consequently, $\frac{140}{420}$, $\frac{168}{420}$, $\frac{315}{420}$, $\frac{360}{420}$, are the new fractions required.

To bring mixed numbers into FRACTIONS, *and the contrary.*—Mixed numbers are brought into improper fractions by the following

Rule.—Multiply the integers, or whole numbers, with the denominator of the given fraction, and to their product add the numerator of the fraction required.

Thus, $9\frac{4}{5}$ will become $\frac{49}{5}$; and $7\frac{6}{7} = \frac{54}{7}$.

To abbreviate or reduce FRACTIONS *into their lowest or least denomination.*

Rule.—Divide the greater number by the lesser, and that divisor by the remainder, if their be any, and so on continually, until there be no remainder left; then will the last divisor be the greatest common measure; and, if it happen to be 1, then are those numbers prime numbers, and are already in their lowest terms; but, if otherwise, divide the numbers by that last divisor, and their quotients will be their least terms required.

Example.—Let it be required to find the greatest common measure of 72 and 108, viz. of $\frac{72}{108}$.

72) 108 (1
$\frac{72}{36}$) 72 (2
72
(.)

Here, because there is no remainder, 36 is the greatest common measure.

Then $72 \div 36 = 2$, the numerator; and $108 \div 36 = 3$, the denominator: therefore $\frac{72}{108}$ is abbreviated to $\frac{2}{3}$, the loweſt terms.

Algebraical fractions are ſet down in every reſpect, and alſo managed in the ſame manner, as vulgar fractions; therefore, if vulgar fractions are well underſtood, theſe will be very eaſy; for, $\frac{a-b}{a}$, $\frac{a+b}{a}$, and $\frac{a}{b}$ of $\frac{a-b}{aa}$, are algebraic fractions which differ not in the leaſt from vulgar ones in their nature and management.

For *Addition*, *Subtraction*, and *Multiplication* of FRACTIONS, See the articles ADDITION, SUBTRACTION, &c.

FRACTURE, in ſurgery, a rupture of a bone; or a ſolution of continuity in a bone, when it is cruſhed or broken by ſome external cauſe.

The word is Latin, *fractura*, and derived from *frango*, to break.

In curing fractures, the principal concern ſhould be the agglutination of the bone: take care, therefore, 1. that it is reduced to its proper ſituation, and this is done by extenſion and repoſition; 2. after reduction, apply a proper bandage, and preſcribe reſt to your patient; 3. prevent, or remedy, the inconveniencies that may enſue, and the ſurgeon will be qualified for this, if he knows, 1. how the bones are ſituated, whether there are one or more in the limb, whether they are large or ſmall, robuſt or ſpongy, even or uneven, and whether one or more be fractured; 2. what muſcles are near, with their poſition and office; 3. Whether any of the larger nerves, veins, or arteries, are near; for a thorough knowledge of theſe things conduces very much to a ſucceſsful cure.

When the fractured bones continue in their natural poſition, a proper bandage will promote the agglutination of the fragments, without repoſition or extenſion; though, as often as they recede from each other, ſome degree of extenſion is abſolutely neceſſary, which muſt always be proportioned to the diſtortion of the fragments; for the wider the ſeparation and the ſhorter the limb, from a contraction of the muſcles, the greater extenſion is required. But this operation muſt be performed tenderly, leſt too great violence ſhould injure the patient.

In extending a fractured limb, care is to be taken, 1. that the patient is kept ſteady, to prevent his giving way to the extenſion. The poſture muſt be accommodated to the circumſtances; for ſometimes ſitting in a chair, or on the floor, ſometimes lying on a bed, or table, is more commodious. 2. The broken limb, both above and below the fracture, muſt be held by an aſſiſtant. 3. The aſſiſtant who holds the lower part, muſt extend it with ſtrength ſufficient to replace the fragments; but, if the hands alone are not ſufficient, uſe a rope or napkin; and if one man is not enough, employ two or three. Obſerve always to proceed with tenderneſs, that you may not rack the patient with unneceſſary tortures.

There remains one very important obſervation relative to the extenſion of fractured bones, which is, that if the ſurgeon is called in after tumours, or violent inflammations come on, he ought to defer the extenſion, till they are removed; for, under theſe circumſtances, the parts affected cannot be handled, compreſſed, or extended, without much acute pains, convulſions, and the danger of a ſphacelus: but if the tumor or inflammation are ſlight, we may eaſily proceed to extenſion directly, in order to prevent their increaſe.

FRÆNUM, in anatomy, a term applied to ſome membranous ligaments of the body. As,

FRÆNUM LINGUÆ, the ligament under the tongue; which ſometimes ties it down too cloſe to the bottom of the mouth, and then requires to be inciſed or divided, in order to give this organ its proper and free motion. This diſorder generally ariſes in infants ſoon after their birth, ſo that they cannot move and exert their tongues in the action of ſucking: though it is ſometimes alſo obſerved in adults.

Each of the lips has alſo its peculiar frænum: the upper one under the noſe; the under one near the roots of the dentes inciſores: theſe are of the utmoſt ſervice to us in ſpeaking, and eating and drinking.

FRÆNUM PENIS, a ligament of the penis, that ties the prepuce to the lower part of the glans of the penis. See PENIS.

There is alſo a ſmall frænum of the clitoris, by which it is connected to the oſſa pubis. See the article CLITORIS.

FRAGARIA, the ſtrawberry, in botany. See the article STRAWBERRY.

FRAIL, a baſket made of ruſhes, or the like, in which are packed up figs, raiſins, &c. It ſignifies alſo a certain quantity of raiſins, about ſeventy-five pounds.

FRAISE, in fortification, a kind of defence, conſiſting of pointed ſtakes, ſix or ſeven feet long, driven parallel to the horizon into the retrenchments of a camp, a half-moon, or the like, to prevent any approach or ſcalade.

Fraiſes differ from paliſades chiefly from this, that the latter ſtand perpendicular to the horizon, and the former jet out parallel to the horizon, or nearly ſo, being uſually made a little ſloping, or with points hanging down. Fraiſes are chiefly uſed in retrenchments and other works thrown up of earth; ſometimes they are found under the parapet of a rampart, ſerving inſtead of the cordon of ſtone uſed in ſtone works.

To FRAISE *a Battalion*, is to line the muſqueteers round with pikes, that, in caſe they ſhould be charged with a body of horſe, the pikes being preſented, may cover the muſquetteers from the ſhock of the horſe, and ſerve as a barricade.

FRAME,

FRAME, in joinery, a kind of caſe, wherein a thing is ſet or incloſed, or even ſupported, as a window-frame, a picture-frame, &c.

FRAME is alſo a machine uſed in divers arts; as,

FRAME, among printers, is the ſtand which ſupports the caſes. See the article CASE.

FRAME, among founders, a kind of ledge incloſing a board, which, being filled with wetted ſand, ſerves as a mould to caſt their works in.

FRAME is more particularly uſed for a ſort of loom, whereon artificers ſtretch their linens, ſilks, ſtuffs, &c. to be embroidered, quilted, or the like.

FRAME, among painters, a kind of ſquare, conſiſting of four long ſlips of wood joined together, whoſe intermediate ſpace is divided by threads into ſeverel little ſquares like a net; and hence ſometimes called reticula. It ſerves to reduce figures from great to ſmall; or, on the contrary, to augment their ſize from ſmall to great.

FRAMING, a term uſed among gardeners, for the boxes and lights which cover the plants raiſed on common hot-beds.

FRAMING *of an Houſe*, among carpenters, denotes all the timber-work therein; namely, the carcaſe, flooring, partitioning, roofing, cieling, beams, aſhlering, &c. all together.

FRANCHISE, in a general ſenſe, a privilege or exemption from ordinary juriſdiction; as that for a corporation to hold pleas among themſelves to ſuch a value, or the like.

FRANCHISE is ſometimes uſed for an immunity from a tribute, in which ſenſe it is either perſonal or real; that is, belonging to a perſon immediately, or elſe by means of this or that place of which he is chief, or a member.

FRANCHISE is alſo uſed for an aſylum or ſanctuary, where people are ſecure of their perſons. See ASYLUM.

FRANCISCAN MONKS, FRIARS-MINOR, or GREY-FRIARS, religious of the order of St. Francis; founded by him in the year 1209.

FRANGULA, black berry bearing alder, in botany, a plant with a woody ſtem, with many irregular branches covered with a dark bark; theſe are furniſhed with oval ſpear-ſhaped leaves. The flowers are produced in cluſters at the ends of the former year's ſhoots; theſe are very ſmall, erect, and apetalous, of an herbaceous colour, and contains five ſtamina. The flowers are ſucceeded by ſmall round berries, which are firſt red, but when ripe turn black. It flowers in June, and the berries ripen in September.

FRANKENIA, in botany, a genus of plants whoſe flower contains five petals, with a plane border and ſix filaments, topped with twin antheræ. The fruit is an oval, unilocular, and trivalvular capſule, containing a great many ovated very ſmall ſeeds.

FRANK LANGUAGE, or LINGUA FRANCA, a kind of jargon ſpoken in the Mediterranean, and particularly throughout the coaſts and parts of the Levant, compoſed of Italian, Spaniſh, French, vulgar Greek, and other languages.

FRANK-LAW, a word applied to the free and common law of the land, or the benefit a perſon has by it.

FRANK-PLEDGE, in our law, ſignifies a pledge or ſurety for the behaviour of freemen.

FRANKINCENSE, *Thus*, in the materia medica. See the article THUS.

FRANKS, FRANKIS, or FRANQUIS, an appellation given by the Turks, and other nations of Aſia, to all the inhabitants of the weſtern parts of Europe, to which they give the name of Frankiſtan.

FRAPPING, among ſailors, the act of croſſing and drawing together the ſeveral parts of a tackle, or other complication of ropes drawn tight to ſecure any body. The frapping always increaſes the tightneſs, or of courſe adds to the ſecurity acquired by the purchaſe.

FRAPPING *a Ship*, paſſing four, five, or ſix turns of a cable round the body or hull of a ſhip in the middle, to ſecure her in a great ſtorm, when it is apprehended ſhe has not ſufficient ſtrength to reſiſt the violent efforts of the waves: this expedient, however, is rarely put in practice, unleſs in very old ſhips, which the owners are willing to venture till the laſt.

FRATERNITY, in the Roman catholic countries, ſignifies a ſociety for the improvement of devotion.

FRATERNITY, in a civil ſenſe, a company or gild of certain artificers or traders. See the articles COMPANY and GILD.

FRATRICELLI, LITTLE BROTHERS, in church hiſtory, a ſect of heretics who appeared in Italy about the year 1298, and afterwards ſpread all over Europe. They wore the habit of the Franciſcan order, and pretended that eccleſiaſtics ought to have no poſſeſſions of their own.

FRATRIAGE, *Fratriagium*, the partition among brothers or coheirs, coming to the ſame inheritance or ſucceſſion.

FRATRICIDE, the crime of murdering one's brother. See PARRICIDE.

FRAUD, in law, ſignifies deceit in grants or conveyances of lands, &c. or in bargains and ſales of goods, &c. to the damage of another perſon.

FRAXINELLA, in botany. See DICTAMNUS.

FRAXINUS, the aſh-tree, in botany. See the article ASH.

FREAM, a name given by farmers to ploughed lands worn out of heart, and laid fallow till it recovers. See FALLOWING.

FRECKLES, *Lentigines*, in medicine, ſmall, yelloviſh, or duſky ſpots appearing on the ſkin, chiefly about the face, neck, and hands. It is moſtly

moſtly a natural affection cauſed by the heat of the ſun, whereby ſome parts of the ſkin appear of a darker colour than uſual, called tan, ſunburn, and morphew, which differ only in degree, and uſually diſappear in winter.

Mr. Homberg's medicine, which is compoſed of bullock's gall mixed with alum, and after the alum is precipitated, expoſed three or four months in the ſun in a cloſe phial, is the beſt remedy.

FREE, in a general ſenſe, is uſed in oppoſition to whatever is conſtrained or neceſſiated. When applied to things endowed with underſtanding, it more peculiarly relates to the liberty of the will.

FREE-BENCH, ſignifies that eſtate in copyhold which the wife, being eſpouſed a virgin, has after the deceaſe of her huſband for her dower, according to the cuſtom of the manor.

FREE STATE, a republic governed by magiſtrates elected by the free ſuffrages of the inhabitants.

FREE-STONE, a whitiſh ſtone dug up in many parts of England, that works like alabaſter, but is more hard and durable; being of excellent uſe in building, &c. It is a kind of a grit ſtone, and is called free, from its being of ſuch a conſtitution as to cut freely in any direction: ſuch is the Portland-ſtone, and the free-ſtone of Kent.

FREE-THINKER. See the article DEIST.

FREE-WARREN, the power of granting or denying licence to any one to hunt in ſuch and ſuch ground.

FREE *the Boat*, or bale the boat, among ſailors, throw out the water.

FREEDOM, in general, the ſtate or quality of being free.

FREEDOM *of a Corporation*, the right of enjoying all the privileges and immunities belonging to it.

FREEDOM *of the Will*, that power or faculty of the mind, whereby it is capable of acting, chuſing, or rejecting, whatever it judges proper.

FREEDOM *of Contrariety*, among moraliſts, that of chuſing either of two oppoſites, as virtue or vice, good or evil; concerning which the received doctrine is, that mankind have a freedom of contradiction, but not of contrariety; that is, they may abſtain from the purſuit of virtue and good, but are incapable of hating them, or of preferring their oppoſites.

FREEZE, or FRIEZE, in architecture. See the article FRIEZE.

FREEZE, or FRIEZE, in commerce, a coarſe kind of woollen ſtuff, or cloth, for winter wear; ſo called, as being freezed or napped on one ſide.

FREEZING, in natural philoſophy, the ſame with CONGELATION, which ſee.

The principle which authors have gone upon, in order to ſolve the phænomena of freezing, are either, firſt, according to Gaſſendus, that ſome foreign matter is introduced into the pores of the fluid, by means whereof its bulk is increaſed, and its parts become fixed.

And theſe gentlemen, to ſolve it, apply to certain nitrous particles, properly formed to produce this effect; in regard ſal ammoniac, ſaltpetre, ſalt of urine, and many other volatile and alkalizate ſalts, mixed with water, increaſe its degree of cold very ſenſibly. And the manner in which theſe particles are preſumed to hinder the fluidity of water is, that they are conſtituted of rigid pointed ſpicula, eaſily, they ſay, driven into the globules of water, which, being variouſly mingled, and as it were intangled together, by degrees enfeeble, and finally deſtroy the motion thereof.

Secondly, the followers of Des Cartes aſſert, that ſome matter, naturally contained in the fluid, is by an intenſe degree of cold expelled, through the abſence of which, the body becomes fixed. And this they preſume to be brought about by the receſs of the active, ætherial matter, to which they aſcribe all motion of bodies, out of the pores of the water, or at leaſt to a very large abatement of it. And conſidering the known phænomena of the freezing of the natural fluids (the attraction and repulſion of whoſe parts in a ſtate of fluidity are pretty near equal, and therefore eaſily moved one among another; as alſo from the melting of ſuch as are only reduced to a ſtate of fluidity by heat, the parts being put under a degree of extraordinary vibration, which by cold again becomes rigid, wherein the attraction of their parts ſeems greatly to overpower that of their repulſion; whence proceeds what we call coheſion, tenacity, viſcidity, and the like) we cannot refute either of the ſyſtems abovementioned, ſince neither of them at preſent come under proof by any experiment: they are therefore purely hypothetical.

But the third opinion on this ſubject, according to a late French author, is, that there is ſome alteration produced in the texture or form either of the fluid particles, or of ſomething contained in them.

In favour of this laſt, it may be obſerved, that a globule of water held on the point of a needle, in a ſmart froſt, will, upon freezing, ſhoot itſelf out into a ſtar, having a certain number of points; and ſnow, which is a frozen vapour, ſeems to be no more than a congeries of theſe ſtars, united to each other by the tips of thoſe points, and by no means adapting themſelves to, or filling the interſtices between them: it muſt therefore follow, that the dimenſions of a quantity of water, reduced thus by cold from a fluid to a fixed ſtate, will be conſiderably enlarged.

FREEZING, in naval affairs, a ſort of ornamental painting, conſiſting of trophies, flower-work, &c. on

on a ſhip's quarter, ſtern, or fore part immediately below the upper-edge of her ſides, called the gunnel.

FRIEZING-MIXTURE, a compoſition of ſnow, or ice pulverized, mixed with nitre, or any other penetrating ſalt, which will cauſe ſo intenſe a degree of cold, as to fix or congeal the mercury in the thermometer. See COLD.

FREIGHT, or FRAIGHT, in navigation and commerce, the hire of a ſhip, or a part thereof, for the conveyance and carriage of goods from one part or place to another; or the ſum agreed on between the owner and the merchant, for the hire and uſe of a veſſel.

FREIGHT, is alſo uſed for the burden or lading of a ſhip, or the cargo of goods, &c. which ſhe has on board.

FREIGHT alſo ſignifies a duty of fifty ſols per tun, paid to the crown of France by the maſters of foreign veſſels going in or out of the ſeveral ports of that kingdom.

FRENUM, or FRÆNUM, in anatomy. See FRÆNUM.

FRENZY, or PHRENZY, in medicine. See the article PHRENZY.

FRESCO, a method of painting in relievo on walls, ſo as to endure the weather.

It is performed with water-colours on freſh plaiſter; or on a wall laid with mortar not yet dry. This ſort of painting has a great advantage by its incorporating with the mortar, and drying along with it, becomes very durable.

FRESHEN *the Hauſe*, among ſailors, when a ſhip rides at anchor, there is always ſome canvas, mat, leather, or ſuch like matter, wound about the cable in the hawſe-hole, and where it may rub againſt the ſtem: the matter uſed on this occaſion is called ſervice, and, as by the pitching and labouring of a ſhip in a ſtorm when ſhe is anchored in an open road or bay, the ſervice muſt be in a ſhort time wore through, it is neceſſary to have it frequently renewed for the preſervation of the cable, on which all depends; and this act of renewing the ſervice is called freſhening the hawſe, which is a circumſtance a ſeaman can never be too careful in obſerving. See the article HAWSE.

FRESHES, among ſailors, the violence of an abb-tide, encreaſed by heavy rains, flowing into the ſea, which it diſcolours to a conſiderable diſtance from the ſhore on ſuch occaſions, where the line on which the two colours meet, may be diſtinctly obſerved for a conſiderable length along the coaſt.

FRET, or FRETTE, in architecture, a kind of knot or ornament, conſiſting of two liſts or ſmall fillets variouſly interlaced or interwoven, and running at parallel diſtances equal to their breadth.

Every return and interſection of theſe frets muſt be at right angles, otherwiſe they loſe all the beauty, and become perfectly Gothic. Sometimes the fret conſiſts but of a ſingle fillet, which, if well diſpoſed, may be made to fill its ſpace exceeding well. Frets were very much uſed by the ancients, eſpecially on even flat members, or parts of a building, as the faces of the corona, and eves of corniches; under the roofs, ſoffits, &c. and on the plinths of baſes. See the articles CORONA, EVE, &c.

FRET, in heraldry, a bearing compoſed of ſix bars, croſſed, and variouſly interlaced; ſome call it the true lover's knot.

FRET, in muſic, ſignifies a kind of ſtop on ſome inſtruments, particularly baſs-viols and lutes. Frets conſiſt of ſtrings tied round the neck of the inſtrument, at certain diſtances, within which ſuch and ſuch notes are to be found.

FRET-WORK, that adorned with frets. It is ſometimes uſed to fill up and enrich flat empty ſpaces; but is moſtly practiſed in roofs, which are fretted over with plaiſter-work. The Italians alſo uſe fretworks in the mantling of chimneys with great figures; a cheap piece of magnificence, and as durable almoſt within doors, as harder matters in the weather.

FRETTY, in heraldry, an appellation given to bearings made up of ſix, eight, or more bars laid acroſs each other, in the manner of frets.

FRIABLE, among naturaliſts, an appellation given to bodies that are eaſily crumbled to pieces: ſuch are the free-ſtone, pumice-ſtone, &c.

FRIAR, or FRIER, from the French *frere*, a brother, a term common to monks of all orders, founded on this, that there is a kind of fraternity, or brotherhood, between the ſeveral religious perſons of the ſame convent or monaſtery.

FRIAR'S COUL, in botany, a name given to ſeveral ſpecies of arum. See the article ARUM.

FRICTION, the rubbing or chafing of the ſurface of one body againſt another: thus when one body inſiſts on another upon an horizontal plane, it preſſes it with all its weight, which being equally re-acted on (and therefore the whole effect of its gravity deſtroyed) by the plane, it will be abſolutely free to move in any lateral or horizontal direction by any the leaſt power applied thereto, provided both the touching ſurfaces be perfectly ſmooth or even.

But ſince we find no ſuch thing as perfect poliſture or evenneſs in the ſurfaces of bodies (at leaſt ſuch as are produced by art) but an evident roughneſs or unevenneſs of the parts in the ſurface, ariſing from the poroſity and peculiar texture of the body, it is eaſy to underſtand that when two ſuch ſurfaces come together, the prominent parts of the one will in ſome meaſure fall into the concave parts of the other, and therefore, when an horizontal motion is attempted in one, the fixed prominent parts of the other will give more or leſs reſiſtance to the moving ſurface, by holding and detaining its parts, which is what we call friction.

Now since any body will require a force proportional to its weight to draw it over a given obstacle, it follows that the friction arising to the moving body will always be in proportion to its weight only, and not the quantity of the surface, by which it bears upon the resisting plane or surface. Thus if a piece of wood four inches wide, and one inch thick, be ground, and thereby made exactly fit to the surface of another fixed piece of the same wood, it will require the same weight to draw it along on the same, whether it be laid on its broad or narrow side.

For though on the broad side there be four times the number of touching particles (*cæteris paribus*) yet each particle is pressed with but $\frac{1}{4}$ of the weight that those are on the narrow side; and since four times the number multiplied by $\frac{1}{4}$ of the weight, is equal to $\frac{1}{4}$ of the number multiplied by four times the weight, it is plain the effect, that is the resistance, is equal in both cases, and so requires the same force to overcome it.

The reason why the friction is proportional to the weight of the moving body, is, because the power applied to move the body must raise it in some measure upon and over the prominent parts of the surface on which it is drawn; and this motion of the body, as it is not upright, so it will not require a power equal to its whole weight; but being in the nature of the motion on an inclined plane, (since the body bears on the prominent parts all the while) the power which moves it will be proportional to but a part of its weight only; and this will vary with the various degrees of smoothness or asperity between the rubbing surfaces, and the other concurring circumstances.

We find by experiment, that a body ABCD (Plate LVI. *fig.* 1.) of wood, brass, &c. laid on the surface EFGH, will be drawn along by the weight P, nearly equal to one third of its own weight; if the surfaces be hard and well polished, it will be less than a third part; but if the parts be soft or rugged, it will be much greater. Thus also the cylinder of wood AB (*fig.* 2.) if very smooth, and laid on two well-polished supporters C, D, (having been first oiled or greased) and then charged with the weight of two pounds in the two equal balls G, H, it will require an additional weight *x* (equal to about a third part of the two pounds) to give motion to, or overcome the friction of the said cylinder.

Now this additional weight, as it causes a greater pressure of the cylinder, will likewise encrease the friction, and therefore require the addition of another weight *y*, equal to the third part of its own; for the same reason the weight *y* will require another *z*, a third part less; and so on *ad infinitum*. Hence upon supposition that the friction is precisely equal to a third of the weight, the first weight with all the additional ones, viz. 2, $\frac{2}{3}$, $\frac{2}{9}$, $\frac{2}{27}$, &c. will be a series of numbers in geometrical progression decreasing. Now the sum of all those terms, except the first (i. e. the sum of all the infinite number of additional weights $x+y+z$, &c.) is found (by a known theorem in arithmetic) to be equal to one pound. So that if the weight of the cylinder be inconsiderable, the way to overcome the friction would be to double the power G, or H, at once.

But though we may at a medium allow about a third part of the weight with which any simple machine is charged for the friction arising from thence, yet this is very precarious and seldom the case; for if ABCD (*fig.* 3.) be a piece of brass of six ounces, and EFGH be also a plate of brass, and both the surfaces well ground and polished, the weight P, of near two ounces, will be required to draw along the body AC alone; but if AC be loaded with 6, 8, or 10lb. then a sixth part of the weight will be sufficient to draw it along the plane. If the plane be covered with a linen or woollen cloth, then a third, or half part, and sometimes more, will be requisite to draw it along on the plane.

FRICTION, in medicine, the rubbing a diseased part, either with or without unguents, oils, &c. Dr. Cheyne greatly recommends friction with a flesh-brush to persons of weak nerves and sedentary lives; by which means a full and free perspiration would be promoted, and obstructions removed, to the great relief of many valetudinarians.

FRIEZE, FREEZE, or FRIZE, in architecture, a large flat face, or member, separating the architrave from the corniche, being that part of the entablature between the architrave and corniche.

This member was by the ancients called zophorus, because it was commonly enriched with the figures of animals. The frieze is supposed to be designed to represent the heads of the transverse beams, which sustain the roof or covering.

In the Tuscan order it is quite plain, but is enriched with triglyphs in the Doric; it is sometimes made arched or swelling in the Ionic: in the Corinthian and Composite it is frequently joined to the architrave by a little sweep, and sometimes to the corniche; and in these richer orders, it is commonly adorned with sculpture, figures, compartments, histories, foliages, festoons, &c.

From the variety of their ornaments, friezes obtain various denominations.

Convex or *Pulvinated* FRIEZES, such whose profile is a curve, the best proportion of which is when drawn on the base of an equilateral triangle.

In some the swelling is only at top, as in a console; in others at bottom, as in the balluster.

Flourished FRIEZES, such as are enriched with rinds of imaginary foliages, as the Corinthian frize of the frontispiece of Nero: or with natural leaves, either in clusters or garlands; or continued, as in the Ionic of the gallery of Apollo in the Louvre.

Hi-

Hiſtorical FRIEZE, ſuch as are adorned with baſs-relievos, repreſenting hiſtory, ſacrifices, &c. as the arch of Titus at Rome.

Marine FRIEZES, ſuch as repreſent ſea-horſes, tritons, and other attributes of the ſea, as ſhells, baths, grottos, &c.

Ruſtic FRIEZES, ſuch whoſe courſes are ruſticated or emboſſed, as in the Tuſcan frieze of Palladio.

Symbolical FRIEZES, thoſe adorned with the attributes of religion, as the Corinthian of the temple behind the capitol at Rome, whereon are repreſented the inſtruments and apparatus of ſacrifice.

FRIGATE, in the marine, a light nimble ſhip, built for quick ſailing: frigates carry from twenty to thirty-eight cannon, and are eſteemed excellent cruiſers.

Formerly the name of frigate was only known in the Mediterranean, and given to a kind of long veſſel, which they made uſe of in thoſe ſeas, and went with ſails and oars. The Engliſh were the firſt who appeared on the ocean with thoſe ſhips; and fitted them for action as well as ſailing.

FRIGID, is applied to a jejune ſtile, that is unanimated by any ornaments, and conſequently without any force or vigour.

FRIGID ZONE, in geography. See the article ZONE.

FRIGORIFIC, in phyſiology, ſmall particles of matter, which, according to Gaſſendus and others, being actually and eſſentially cold, and penetrating other bodies, produce in them that quality which we call cold. See COLD.

FRIST, in the mercantile ſtyle, ſignifies ſelling goods upon credit, or truſt.

FRIT, in the glaſs manufacture, the matter or ingredients of which glaſs is to be made, when they have been calcined or baked in a furnace; or it is the calcined matter to be run into glaſs. See GLASS.

There are three kinds of frit; the firſt, that made for cryſtal; the ſecond, or ordinary frit, is that made for the common white or cryſtalline metal; and the third, that made for green glaſs.

The frit for cryſtal is made as follows: take two hundred pounds of tarſo, powdered fine, and ſifted; of the ſalt of polverine, one hundred and thirty pounds; mix them well together, and put them in the calcar, a ſort of oven, or reverberatory furnace, which ſhould firſt be well heated: here let them remain, baking, frying, and calcining, for five hours, during which, the workman keeps mixing them with a rake, to make them incorporate.

The ſecond, or ordinary frit, is made of bare aſhes of polverine, without extracting the ſalt from them.

The third, for green glaſs, is made of common aſhes, without any preparation.

It may be obſerved, that glaſs might be made by immediately melting the materials, without this calcining and making them into frit; but the operation would be much more tedious.

FRIZING *of Cloth*, a term in the woollen manufactury, applied to the forming of the nap of a cloth, or ſtuff, into a number of little hard burrs or prominences, covering almoſt the whole ground thereof.

Some cloths are only frized on the back-ſide, as black cloths; others on the right-ſide, as coloured and mixed cloths, rateens, baize, freezes, &c.

FROG, *Rana*, in zoology, a genus of amphibious animals, the body of which is broad and ſhort, without a tail, and furniſhed with four legs.

FROG, among farriers, the ſame with fruſh. See FRUSH.

FRONDES, among botaniſts, denote leaves conſiſting of ſeveral other leaves, and forming the whole of the plant; as is the caſe of the fern-kind, in which, the fructification being on the back of the leaves, the ſingle leaf makes the whole plant, and is called frondis, not folium.

FRONT *of a Battalion*, among military men, is the firſt rank, or file-leaders. It is likewiſe called the face or head of a battalion.

FRONT *of a Place*, or the TENAILLE, in fortification, all that is contained between the flanked angles of the two neighbouring baſtions, viz. the two faces, two flanks, and the curtain.

FRONT, in architecture, the principal face or ſide of a building, or that which is preſented to the chief aſpect or view.

FRONT, in perſpective, a projection or repreſentation of the face or forepart of an object, or of that part directly oppoſite to the eye, which is more uſually called the orthography. See ORTHOGRAPHY.

FRONTAL, in architecture, a little fronton, or pediment, ſometimes placed over a little door, or window.

FRONTAL, or FRONTLET, or BROW-BAND, is alſo uſed in ſpeaking of the Jewiſh ceremonies.

This frontal conſiſts of four ſeveral pieces of vellum, on each whereof is written ſome text of Scripture: they are all laid on a piece of calf's leather, with thongs to tie it by.

The Jews apply the leather with the vellum on their foreheads in the ſynagogue, and tie it round the head with the thongs.

FRONTALE, in medicine, a name for any external medicine, or topic, applied to the forehead: more particularly it means a refrigrating and hypnotic remedy, prepared of cold cephalics, bruiſed and tied up in a linen bag, four or five fingers breadth.

FRONTATED, a term uſed by botaniſts relating to the leaf of a flower, which grows broader and broader, perhaps terminating in a right-line: and is uſed in oppoſition to cuſpidated, that is, when the leaves of the flower end in a point.

FRONTIER, the border, confine, or extremity of

of a kingdom or province, which the enemies find in front, when they would enter the ſame: thus we ſay, a frontier town, a frontier province, &c. Frontiers were anciently called marches.

FRONTIS Os, in anatomy, called alſo os coronale, the bone of the forehead.

This is a bone of the cranium, of an irregular form, double in infants, but in adults uſually ſingle: ſometimes, however, it is divided in theſe into two parts down to the noſe. It is ſituated in the anterior part of the ſkull, and forms that part of the face which is called the forehead, from whence it has its name. Its figure is ſymmetrical, reſembling a large ſhell, almoſt round. See the article SKULL.

FRONTISPIECE, in architecture, the portrait or principal face of a building. See BUILDING.

FRONTISPIECE is alſo uſed to ſignify an ornament fronting the title page of a book, which, in ſome meaſure, ſhould expreſs the ſubject treated of.

FRONTON, in architecture, the ſame with pediment. See the article PEDIMENT.

FROST, in phyſiology, ſuch an exceſſively cold ſtate of the air, as converts watery fluids into ice. See the articles FREEZING and ICE.

FROTH, a white light ſubſtance, formed on the ſurface of fluids, by vehement agitation; conſiſting of little ſphericles, or globules.

FROTH-SPITTLE, or CUCKOO-SPITTLE, a name given to a white froth, or ſpume, very common in the ſpring, and firſt months of the ſummer, on the leaves of certain plants, particularly on thoſe of the common white field lychnis, or catch-fly, thence called by ſome ſpatling poppy.

All writers on vegetables have taken notice of this froth, though few have underſtood the cauſe or origin of it till of late; being formed by a little leaping animal, called by ſome, the flea-graſhopper; by applying its anus cloſe the leaf, and diſcharging thereon a ſmall drop of a white viſcous fluid, which, containing ſome air in it, is ſoon elevated into a ſmall bubble; before this is well formed, it depoſits ſuch another, and ſo on, till it is every way overwhelmed with a quantity of theſe bubbles, which form the white froth which we ſee.

FRUCTIFEROUS, ſignifies properly any thing that produces fruit; but, in a more large and figurative ſenſe, it is uſed by ſome, particularly lord Bacon, for ſuch experiments in natural philoſophy, as prove advantageous to the experimenter in point of gain or profit.

FRUCTIFICATION, among botaniſts, comprehends both the flower and fruit of plants which cannot be well ſeparated; for though the fruit does not ſwell and ripen till after the flower is fallen, its rudiment, or firſt beginning, is in the flower, of which it properly makes a part.

Linnæus defines the fructification to be a temporary part of vegetables allotted to generation, terminating the old vegetable and beginning the new: it conſiſts of ſeven principal parts, viz. 1. the calyx; 2. the corolla; 3. the ſtamina; 4. the piſtillum; 5. the pericarpium; 6. the ſemina, or ſeeds; 7. the receptacle. See them explained under their reſpective articles.

FRUGIVOROUS BIRDS are ſuch as feed on fruits, either wholly or in part.

FRUIT, in general, includes whatever the earth produces for the nouriſhment and ſupport of man and other animals, as herbs, grain, hay, corn, &c. See the articles HERB, GRAIN, &c.

FRUIT more properly ſignifies the production of a tree or plant for the propagation or multiplication of its kinds; in which ſenſe the word includes all kinds of ſeeds with their furniture; but botaniſts uſually underſtand by it that part of a plant wherein the ſeeds are contained.

The fruit of plants is the product or reſult of a flower, or that for whoſe production, nutrition, &c. the flower was intended, and in all plants the eſſential parts of the fruit appear to be only continuations or expanſions of thoſe which are ſeen in the other parts of the tree, and have a communication with the remoteſt parts, that is, the ſame fibres which conſtitute the root, trunk, and boughs, are extended into the fruit itſelf.

Fruits being known by the different ſtructure or formation of their parts, botaniſts have therefore applied particular denominations to them, in order to render their deſcription more certain; as the nut, berry, pod, capſule, drupe, pomum, &c. See the articles NUT, BERRY, &c.

Fruits are ſerviceable in guarding, preſerving, and feeding the incloſed ſeed; in filtrating the coarſer, more earthy, and ſtrong parts, of the nutritious juice of the plant, and retaining it to themſelves, ſending none but the moſt pure, elaborated, and ſpirituous parts to the ſeed, for the ſupport and growth of the tender, delicate embryo, or plantule therein contained.

The uſe of fruits might be rendered much more extenſive than it is: many fruits which do hurt when eaten raw, would make wines, equal in flavour to many of thoſe now obtained at a great expence from abroad; and lands, which are not fit for bearing corn, might be a proper ſoil for bearing corn might be a proper ſoil for trees and ſhrubs producing ſuch fruits.—Cherries properly managed make an excellent wine; and, as they are replete with juice, are therefore capable of producing large quantities: the muſſel-plumb, which grows wild, makes a very agreeable wine of conſiderable ſtrength, and, by diſtillation, affords a pleaſant brandy. Gooſeberry and currant wine, in particular, if kept to a proper age, is little inferior to the very high priced wines which our good friends of France ſupply us with.

FRUIT TREES. See the articles PLANTING, PRUNING, GRAFTING, &c. and alſo their reſpective names.

FRUITERY,

FRUITERY, a place for the keeping of fruit, a fruit-houſe, or fruit-loft. A fruitery ſhould be inacceſſible to any thing of moiſture, and ſhould be, as much as poſſible, ſo even to froſt.

FRUMENTACEOUS, a term applied, by botaniſts, to all ſuch plants as have a conformity with wheat, in reſpect of their fruits, leaves, ears, or the like.

FRUSH, or FROG, among farriers, a ſort of tender horn which ariſes in the middle of a horſe's ſole; and, at ſome diſtance from the toe, divides into two branches, running towards the heel, in the form of a fork.

The fruſh is a part of a horſe's foot, the top of which only ſhould be pared, and that every time the foot is pared, otherwiſe it is apt to corrupt.

FRUSTUM, in mathematics, a part of ſome ſolid body ſeparated from the reſt.

FRUSTUM, of a pyramid, or cone, is a piece or part thereof cut off, generally by a line parallel to the baſe. The ſolidity of the fruſtrum of a ſquare pyramid may be found by the following theorem.

To the rectangle of the ſides of the two baſes add the ſum of their ſquares; that ſum being multiplied into one third of the fruſtum's height, will give its ſolidity.

The ſolidity of the fruſtum of a cone may be found by the following theorem.

To three times the rectangle of the two diameters add the ſquare of their difference; that ſum multiplied by the height will give the ſolidity.

FRUTICOSE STALKS, among botaniſts, thoſe with a hard woody ſubſtance. See STALK.

FUCHSIA, in botany, a genus of plants whoſe flower conſiſts of a monopetalous funnel-ſhaped corolla, with four filaments topped with obtuſe antheræ; the fruit is a roundiſh berry, with four furrows and four cells, containing a number of ovated ſeeds, and placed in a double ſeries.

Of this genus there is but one ſpecies hitherto known, which is a native of the warm part of America, therefore requires a hot houſe in this climate to preſerve it.

FUCUS, in botany, a genus of ſubmarine plants belonging to the cryptogamia claſs of Linnæus.

The fucus conſiſts of a tough matter, formed into a kind of leaves, which have ſome appearance of fructification, in punctated tubercles, covering oblong veſicles, ſuppoſed by Linnæus to be male flowers; and ſmooth, roundiſh veſicles, hollow and interwoven with filaments, which appear to him to be female flowers.

There are a great many ſpecies of fucus with broader or narrower leaves, and other peculiarities; one of which, the broad-leaved, ſerrated fucus, grows to the height of ſix, eight, or more inches.

FUGITIVE, a perſon obliged to fly his country, or remove from a place where he had ſome abode, or eſtabliſhment, on account of his crimes, debts, or other occaſions.

FUGUE, in muſic, is when different parts of a muſical compoſition follow each other, each repeating what the firſt had performed.

There are three kinds of fugues; the ſimple, double, and counter.

Single, or *Simple* FUGUE, is ſome point conſiſting of four, five, or more notes, begun by one ſimple part, and ſeconded by a ſecond, third, fourth, fifth, &c. if the compoſition conſiſt of ſo many; repeating the ſame or ſuch like notes, that is, in the ſame proportion, ſo that the ſeveral parts follow, or come in one after another, in the ſame manner; the leading part ſtill flying before thoſe that follow.

FUGUE DOUBLE, or FUGA DOPPIA, is when two or more different points move together in a fugue, and are alternately mixed and interchanged by the ſeveral parts.

FULCRUM, in mechanics, the prop or ſupport by which a lever is ſuſtained. See the article LEVER.

FULICA, the coot, in ornithology, a genus of birds, of the order of the gallinæ, with a naked or bald forehead, and divided or cloven feet: add to this, that all the toes are longer than in whole-footed birds, and have ſemicircular membranes affixed to their joints.

FULIGINOUS, whatever proceeds from a thick, ſooty ſmoke, ſuch as litharge and lamp-black.

FULL-MOON, *plenilunium*, that phaſis of the moon when, in her oppoſition to the ſun, the whole of her diſk is illuminated; in which time eclipſes of the moon can only happen. See the articles MOON and ECLIPSE.

FULLER, a workman employed in the woollen manufactories, to mill, or ſcour, cloths, ſerges, and other ſtuffs, in order to render them more thick, compact, and durable. See CLOTH.

FULLER'S EARTH, *cimolia purpuraſcens*, a kind of marle of a cloſe texture, and of a tolerable ſmooth and gloſſy ſurface, when it has been rubbed. It is extremely ſoft and unctuous to the touch, of a greyiſh brown colour, with ſome admixture of the olive or greeniſh.

The fineſt fuller's earth in the world is dug in England, and all the nations round us would gladly purchaſe it at a great price, were the exportation of it allowed; but one of the great advantages of our woollen manufactory is the keeping it at home. Large quantities of it are dug near Wooburn in Bedfordſhire; there are alſo pits of it in Surry, and ſome other counties; and ſtrata in many places, where it would be very well worth the proprietors while to have it dug, though at preſent it is neglected.

It is of great use in scouring cloths, stuffs, &c. as it imbibes all the oil and grease used in dressing the wool.

Fuller's Weed, in botany, a name sometimes given to the dipsacus, or teasel. See Dipsacus.

FULLING, the art or act of scouring and pressing cloths, stuffs, stockings, &c. to cleanse, thicken, and render them more firm and strong, which is done by means of a water-mill.

In the troughs of the mill are laid the cloths, stuffs, &c. intended to be fulled: then letting the current of water fall on the wheel, the mallets are successively let fall upon them, when by their weight and velocity they stamp and press the stuffs very strongly, which by this means becomes thickened and condensed.

In this operation, fullers earth is used with some proportion of sope; but sope alone would do much better, was it not dearer than fuller's earth.

Fulling of stockings, caps, &c. is performed either with the hands or feet, or a kind of wooden machine, either armed with wooden teeth, or those of horses or bullocks. The ingredients generally used on this occasion are fuller's earth, urine, white and green sope; but water softened with chalk is far preferable.

The following is Mr. Colmet's method of fulling with sope, grounded on experiments made by order of the marquis de Louvois. Let a coloured cloth of about forty-five ells, be laid in the usual manner in the trough of a fulling-mill, without first soaking it in water, as commonly practised in most places. To full this trough-full of cloth fifteen pounds of sope are required, one half of which is to be melted into two pails of river or spring water, made as hot as the hand can bear. Let this solution be poured by little and little, upon the cloth, in proportion as it is laid in the trough: thus it is to be fulled for at least two hours; after which, let it be taken out and stretched. This done, let the cloth be immediately returned into the same trough, without fresh sope, and there fulled two hours more: then take it out, wring it well, and express all the grease and filth. After the second fulling, dissolve the remainder of the sope, as the former part, and throw it at four several times on the cloth, not forgetting to take it out every two hours, to undo the plaits and wrinkles it got in the trough. When it is sufficiently fulled, and brought to a requisite quality and thickness, it is scoured out for good in hot water, keeping it in the trough till it be thoroughly clean. As white cloths full more easily than coloured ones, a third part of the sope may be saved.

FULMINATING, something that thunders, or resembles thunder. See the articles Thunder.

FULMINATION, in chemistry, is used in a synonymous sense with detonation. See Detonation.

FUMIGATION, in chemistry, a kind of calcination, when metals, or other hard bodies, are corroded, or softened, by receiving certain fumes for that purpose.

Fumigation, in medicine, the application of fumes to particular parts of the body; as those of factitious cinnabar to venereal ulcers.

FUMARIA, *Fumitory*, in botany, a genus of plants producing oblong tubulated ringent flowers, including two equally broad filaments terminated with three antheræ to each. The fruit is a short unilocular pod, containing a number of roundish seeds.

The common fumitory is a low annual plant, with bluish green leaves finely divided; the flowers are produced on the tops of the stalks in May and June; the leaves are intensely bitter, and are said to open obstructions, to strengthen the stomach and viscera, and to promote urine; it is also reckoned good against melancholy hypochondraic disorders, the jaundice, and scurvy; and Hoffman gives it the preference to all other herbs as a purifier of the blood.

FUNCTION, the act of fulfilling the duties of any employment.

Function is also applied to the actions of the body.

Function, in algebra, denotes any compound quantity; and when one of the component quantities is variable, it is said to be a variable function. See the article Quantity.

FUND, in anatomy, signifies the bottom of any cavity in the body, thus, the fund of the eye is that part possessed by the choroides and retina; the fund of the uterus, the fund of the bladder, &c. signify also the bottom of these parts. See the articles Eye and Uterus.

Fund, in commerce, signifies the stocks of the great trading and monied companies. See the article Stocks.

Funds is also a term adopted by those who speak of the public revenue of nations, to signify the several taxes that have been laid upon merchandizes either by way of duties of custom, or excise, or in any other manner, to supply the exigencies of the state, and to pay interest for what sums it may have occasion to borrow.

FUNERAL Rites, ceremonies accompanying the interment or burial of any person. See the article Burial.

Funeral Column, a column crowned with an urn, wherein the ashes of some deceased person are supposed to be inclosed; the fust or shaft being beset with tears or flames, the symbols of grief and immortality. See Column.

FUNGUS, in surgery, a soft, fleshy, spongy excrescence, arising in the membranes, tendons, and other nervous parts, in consequence of ulcers, wounds, contusions, &c.

To

To the order of fungi belong ſeveral genera; as, agaric, phallus, cycoperdon, &c. See AGARIC.

FUNNEL *of a Chimney*, the ſhaft or ſmalleſt part of the waſte, where it is gathered into its leaſt dimenſions.

Palladio directs, that the funnels of chimnies be carried through the roof four or five feet at leaſt, that they may carry the ſmoke clear from the houſe into the air. See CHIMNEY.

He alſo adviſes, that chamber-chimneys be not made narrower than ten or eleven inches, nor broader than fifteen; for if too narrow, the ſmoke will not be able to make its way; and if too wide, the wind will drive it back into the room.

FUNNEL-FASHIONED, or FUNNEL-SHAPED FLOWERS, in botany. See the article INFUNDIBULIFORM.

FUR, or FURR, in commerce. See FURR.

FURBISHER, a perſon who furbiſhes, poliſhes, or cleans arms, as guns, ſwords, piſtols, &c. which is chiefly performed with emery.

FURIES, *Eumenides*, *Diræ*, certain goddeſſes, whoſe office it was to puniſh the guilty after death. Theſe were three in number, Alecto, Megæra, and Tiſiphone, who were deſcribed with ſnakes inſtead of hair, and eyes like lightning, carrying iron chains and whips in one hand, and in the other flaming torches; the latter to diſcover, and the former to puniſh the guilty; and they were ſuppoſed to be conſtantly hovering over ſuch perſons as had been guilty of any enormous crime.

Mythologiſts ſuppoſe, that Tiſiphone puniſhed the crimes which ſprang from hatred or anger; Megæra, thoſe from envy; and Alecto, thoſe from an inſatiable purſuit after riches and pleaſure. They were worſhipped at Caſina in Arcadia, and at Carmia in Peloponneſus. They had a temple at Athens, near the Areopagus, and their prieſts were choſen from amongſt the judges of that court. At Telphuſia, a city in Arcadia, a black ewe was ſacrificed to them.

FURLING, in the ſea language, rolling a ſail up cloſe to the yard, ſtay, or maſt, and faſtening it by rolling a bandage or rope cloſe about it; and hence,

FURLING-LINE is a line to faſten the ſail; thoſe which are made for yards are plaited and flat, and called gaſketts.

FURLONG, a long meaſure, equal to $\frac{1}{8}$ of a miles, or forty poles. See the articles MEASURE, MILE, and POLE.

It is alſo uſed in ſome law-books for the eighth part of an acre. See ACRE.

FURLOUGH, in the military language, a licence granted by an officer to a ſoldier, to be abſent for ſome time from his duty.

FURNACE, a veſſel or utenſil for maintaining a ſtrong fire, either of coal or wood.

FURNACE is alſo applied to that uſed in the melting of iron, which authors frequently confound with iron forges, though there is a conſiderable difference between them. See FORGE.

FURNITURE, in dialling, certain additional points and lines, ſuch as the ecliptic, circles of declination, azimuths, Italian hours, points of the compaſs, &c. drawn on dial-planes.

FUROR UTERINUS, a ſpecies of madneſs peculiar to women, proceeding from an ardent and inordinate deſire of coition, which deprives the patient of the uſe of reaſon, ſo that ſhe ſpeaks all manner of obſcene words, and, abandoning all ſhame, invites the men to venereal embraces.

The immoderate deſire of copulation is produced by the plenty, acrimony, and heat of the uterine juices, exceeding the natural bounds, and creating an extraordinary turgency in the ſeminal veſſels, which, ſtimulating in a manner and inflaming the genital parts, excites a vehement and unruly appetite to venereal commerce.

FURR, in commerce, ſignifies the ſkin of ſeveral wild beaſts, dreſſed in alum with the hair on, and uſed as a part of dreſs by princes, magiſtrates, and others. The kinds moſt in uſe are thoſe of the ermine, ſable, caſtor, hare, rabbit, &c. See the articles ERMINE, SABLE, &c.

FURRS, in heraldry, a bearing which repreſents the ſkins of certain beaſts, uſed as well in the doublings of the mantles belonging to the coat-armour, as in the coat-armours themſelves. See ERMINE.

FURR, among carpenters, a piece nailed upon a rafter, to ſtrengthen it when decayed, or to make it ſtraight when it has ſunk in the middle.

FURRING, among carpenters, is the regular faſhioning out any part. When the main piece of the material is ſcanty, either by defects, wains, or want of thickneſs; then a piece of the ſame is put behind it to make good its thickneſs, which is called a furr.

FURUNCLE, or BOIL, in ſurgery, a ſmall reſiſting tumour, with inflammation, redneſs, and great pain, ariſing in the adipoſe membrane, under the ſkin.

As there is no part of the body free from being the ſubject of furuncles, ſo the whole is ſometimes ſo miſerably infeſted with them, that the patient can hardly tell how to ſtir himſelf, or on what part to lie. Not only adults, but alſo the younger, even newborn infants, are obnoxious to this dreadful diſorder, which occaſions in them moſt fatiguing clamour and reſtleſſneſs. Though there is little danger in this diſeaſe in adults, yet, in tender infants, it occaſions convulſions, and even death itſelf.

The principal cauſe of furuncles is a too glutinous and inſpiſſated ſtate of the blood; and, conſequently, the greater the inſpiſſation, the worſe and more numerous will be the furuncles.

With

With regard to the cure, it ſeems to conſiſt chiefly in reſtoring the ſtagnated blood to its former circulation and free motion.

When the furuncles are very numerous, or return again, it is proper to uſe internal purging medicines. and ſuch as attenuate and cleanſe the blood. In adults, bleeding is proper, both by the lancet and ſcarification with cupping; and, at the ſame time, a ſtrict regimen of diet ſhould be uſed, drinking frequently and plentifully of a decoction of the woods, and ſuch like atenuators of the blood. The patient ſhould alſo entirely abſtain from drinking fermented and ſpirituous liquors, particularly wine and its ſpirit; and from the too frequent uſe of tobacco. When the diſorder is recent, external medicines only will frequently ſuffice for the whole cure. For this purpoſe, a mixture of honey, acidulated with ſpirit of vitriol till it has acquired a conſiderable ſharpneſs, is proper to anoint the furuncles. Of no leſs virtue is the frequent touching them with mere ſpirit of vitriol or ſulphur. Diſcutient plaſters are alſo found very ſerviceable, as thoſe of ſimple diachylon, de melito, de ſ. ermaceti, vel diaſaponis.

But if theſe medicines prove inſufficient to diſperſe the tumour, it is to be brought to ſuppuration, by applying a plaſter made of honey and flour, or of diachylon with the gums; and where theſe are inſufficient, to make uſe of the maturating cataplaſms recommended under the article PHLEGMON.

When the furuncle is known to be ripe, by its ſoftneſs and yellow head, recourſe is to be directly had to the ſcalpel; and having made an opening, the corrupted matter contained therein is to be diſcharged: after this, a plaſter of diachylon muſt be applied, and the ulcer daily cleanſed of its matter, till it is healed.

Puſtules and pimples ariſing in the face, are to be treated like furuncles; and, in both caſes, the drinking of whey, and the mineral waters, is accounted good for cleanſing the blood.

When ſucking infants are afflicted with furuncles, it is proper to give the mother, or nurſe, ſome purging medicine, and to order a ſtrict regimen and diet. At the ſame time, the infant ſhould take ſome gentle laxative medicine, with abſorbent powders, to allay the acrimony of its juices. *Heiſter.*

FURZE, or FURZE-BUSH, in botany. See the article ULEX.

FUSAROLE, in architecture, a round member, carved in the manner of a collar or chaplet, with oval beads, and placed immediately under the echinus, in the Doric, Ionic, and Compoſite capitals.

FUSEE, in clock work, is that conical part drawn by the ſpring, and about which the chain or ſtring is wound; for the uſe of which, ſee the articles CLOCK and WATCH.

FUSEE, or FIRELOCK. See MUSKETT.

FUSIBILITY, in natural philoſophy, that quality of bodies which renders them fuſible.

FUSIL, in heraldry, a bearing of a rhomboidal figure, longer than the lozenge, and having its upper and lower angles more acute and ſharp than the other two in the middle.

It is called in Latin, *fuſus*, a ſpindle, from its ſhape.

FUSILIERS, or FUSILEERS, in the military art, are foot ſoldiers, armed with fuſees, or firelocks. See the article FIRELOCK.

FUSILY, or FUSILE, in heraldry, ſignifies a field, or ordinary, entirely covered over with, or divided into, fuſils. See FUSIL.

FUSION, the melting of metals, minerals, &c. by means of fire.

Different metals run in different manners from their ores: thus, lead, though extremely fuſible in the metal, runs with difficulty from the ore, ſo as to require a conſiderable violence of fire. This ſtubborneſs not belonging to the metal, muſt be attributed to the ſtony, ſulphureous, or other mineral matter with which the ore is mixed; which matter ſeems to require a degree of heat capable of vitrifying the lead, before the metal will run: but then the lead thus vitrified, recovers a metallic form again, by coming in contact with the coals. See the article LEAD.

Tin runs from its ore with greater eaſe than lead, and is therefore melted in much leſs furnaces: but copper requires an intenſe heat, or a blaſt furnace; and iron the greateſt heat that can be given in a furnace: and both iron and copper abſolutely require immediate contact with the fuel employed. Hence it appears, that each metal muſt have its determinate degree of heat, to run it with advantage from the ore or ſtone.

In order, likewiſe, to obtain the metal from the ore to the beſt advantage, the ſcoria or ſlag muſt be neceſſarily made to run thin and fluid; otherwiſe it entangles or inviſcates the metal, and will not let it ſeparate fully. And hence we may frequently obſerve, in the aſſaying of copper ores, ſmall grains of metal interſperſed here and there, among the ſcoria, that require to be ſeparated by ſtamping and waſhing the whole maſs; which labour might have been prevented, by uſing a proper degree of heat capable of procuring a thin fuſion and a ſuitable flux, ſo as to have made all the metals fall to the bottom of the crucible; which it conſtantly does, when the operation is well performed. See FLUX.

It ſeems principally owing to a defect in the knowledge of fuſion, that ſo many recrements or ſlags of metals, anciently thrown as uſeleſs from the furnace, have been of late wrought to conſiderable profit by more ſkilful workmen: at leaſt, it ſeems more rational to attribute the ſucceſs to this cauſe, than to a ſuppoſed growth of metals in ſuch ſlags; or to believe

lieve that lead has grown rich in ſilver by lying expoſed to the open air, while, perhaps, it is rather owing to the unſkilfulneſs of the former workmen, who were unable to ſeparate all the ſilver contained in the lead.

All moiſture, and too ſudden cooling, prove prejudicial to the more ignoble metals after fuſion, and ſometimes dangerous to the operator: for a little water falling upon melted iron or copper, makes them expand with prodigious violence, and diſcharge themſelves abroad with a force like that of a cannon; and even ſudden cooling will often occaſion the ſurface of the metal to crack, and ſuffer the more internal part, not yet ſet or fixed, to iſſue out to a conſiderable diſtance; whence either the loſs of the metal or miſchief may enſue.

To prevent theſe ill effects, after copellation it is uſual for the operator to throw a quantity of water, all at once, upon the lump of ſilver, as it lies in the teſt, at the moment when it begins to grow rigid; for the water, by its coldneſs, ſuddenly makes ſo thick a cover upon the ſurface of the ſilver, that the hotter parts in the inſide cannot break through the upper. *Shaw's Chem. Lect.*

FUST, the ſame with the ſhaft of a column. See the articles COLUMN and SHAFT.

FUSTIAN, in commerce, a kind of cotton ſtuff, which ſeems as it were whaled on one ſide.

Right fuſtians ſhould be altogether made of cotton-yarn, both woof and warp; but a great many are made, of which the warp is flax, or even hemp.

There are fuſtians made of ſeveral kinds, wide, narrow, fine, coarſe; with ſhag, or nap, and without it.

FUSTIC, the wood of a ſpecies of mulberry, which grows naturally in the Weſt-Indian iſlands and Campeachy. With us it is much uſed for dyeing yellow.

FUTTOCKS, in ſhip-building, that part of a timber which reaches from the floor to the top-timber. See this diſtinctly explained in the article TIMBER.

FUTTOCK-*Shrowds*. See the article *Futtock*-SHROWDS.

FUTURE, in general, denotes whatever regards futurity, or the time to come. See the article TIME.

FUTURE TENSE, among grammarians. See the article TENSE.

FUZEE, or FUSEE, in military affairs. See the article FUSEE.

FUZEE, among farriers, two dangerous ſplents, joining from above downwards. They differ from ſcrews or thorough ſplents in this, that the latter are placed on two oppoſite ſides of the leg. See the article SPLENT.

G.

GAB

G, in grammar, the ſeventh letter and fifth conſonant of our alphabet; but in the Greek, and all the oriental languages, it occupies the third place. It is one of the mutes, and cannot be ſounded without the aſſiſtance of ſome vowel.

In Engliſh it has a hard and ſoft ſound; hard, as in the words *game*, *gun*, &c. and ſoft, as in the words *geſture*, *giant*, &c. at the end of words, *gh* is pronounced like *ff*, as in the words *rough*, *tough*, &c. The letter *g* is alſo uſed in many words where the ſound is not perceived, as in *ſign*, *reign*, &c.

As a numeral, G was anciently uſed to denote 400; and with a daſh over it, thus $\overline{G}$, 40,000 In muſic it is the character or mark of the treble cleff; and from its being placed at the head, or marking the firſt ſound in Guido's ſcale, the whole ſcale took the name gamut. See the articles CLEF and GAMUT.

GABEL, a word met with in old records, ſignifying a tax, rent, cuſtom, or ſervice, paid to the king, or other lord.

GABEL, according to the French duties or cuſtoms, a tax upon ſalt, which makes the ſecond article in the king's revenue, and amounts to about one fourth part of the whole revenue of the kingdom.

GABIONS, in fortification, baſkets made of ozier-twigs, of a cylindrical form, ſix feet high, and four wide; which being filled with earth, ſerve as a ſhelter from the enemies fire.

They are commonly uſed on batteries, to ſcreen the engineers, &c. in order to which, one is placed on either ſide of each gun, room being only left for the muzzle to appear through. They alſo ſerve as a parapet on lines, lodgments, &c. when the ground is too hard to dig into.

There are a ſmaller ſort, uſed on parapets in trenches, &c. to cover the muſqueteers; which are placed ſo cloſe that the muzzle of a muſquet can hardly be put through.

GABLE, or GAVEL, among builders. See GAVEL.

GAG

GAD, among miners, a ſmall punch of iron, with a long wooden handle, uſed to break up the ore.

One of the miners holds this in his hand, directing the point to a proper place, while the other drives it into the vein, by ſtriking it with a ſledge hammer.

GAD-FLY, or BREEZE-FLY, names given to the black and yellow bodied œſtrus, a fly nearly as large as the common blue fleſh-fly. See OESTRUS.

GAFOLD-LAND, in old law-books, land liable to taxes, and let for rent.

GAGATES, JET, in natural hiſtory. See the article JET.

GAGE, in law-books, the ſame with ſurety or pledge. See the articles SURETY and PLEDGE.

GAGE, in joinery, an inſtrument in which a piece of wood is moveable upon a ſtaff, ſo as to be ſet nearer or farther at pleaſure. Its uſe is to draw a line parallel to the ſtraight ſide of any board, for gaging tenons, and marking ſtuff for an equal thickneſs.

GAGE, among letter-founders, a pieee of box, or other hard wood, variouſly notched; the uſe of which is to adjuſt the dimenſions, ſlopes, &c. of the different ſorts of letters. See *Letter* FOUNDERY.

Sliding-GAGE, a tool uſed by mathematical inſtrument makers, for meaſuring and ſetting off diſtances.

GAGE, or *Weather*-GAGE, in navigation, a ſhip is ſaid to have gained the weather-gage of another when ſhe makes a greater progreſs to the windward, or when ſhe fails to the windward of ſome other. See the article TACKING.

Sea-GAGE, an inſtrument invented by Dr. Hales and Dr. Deſaguliers, for finding the depth of the ſea.

Bucket-Sea-GAGE, an inſtrument contrived by Dr. Hales, to find the different degrees of coldneſs and ſaltneſs of the ſea, at different depths; conſiſting of a common houſhold pail or bucket, with two heads

heads to it. These heads have each a round hole in the middle, near four inches diameter, and covered with valves opening upwards; and that they might both open and shut together, there is a small iron rod fixed to the upper part of the lower valve, and at the other end to the under part of the upper valve; so that as the bucket descends with its sinking weight into the sea, both the valves open by the force of the water, which by that means has a free passage through the bucket. But when the bucket is drawn up, then both the valves shut by the force of the water at the upper part of the bucket; so that the bucket is brought up full of the lowest sea-water to which it had descended.

When the bucket is drawn up, the mercurial thermometer, fixed in it, is examined; but great care must be taken to observe the degree at which the mercury stands, before the lower part of the thermometer is taken out of the water in the bucket, else it would be altered by the different temperature of the air.

In order to keep the bucket in a right position, there are four cords fixed to it, reaching about four feet below it, to which the sinking weight is fixed.

Water-GAGE, or HYDROMETER. See the article HYDROMETER.

GAIANITES, *Gaianitæ*, in church history, a branch of Eutychians. See EUTYCHIANS.

GAIN, in commerce, is used in a synonymous sense with profit. See PROFIT.

GAIN, in architecture, the levelling shoulder of a joist or other timber.

It is also used for the lapping of the end of the joints, &c. upon a trimmer or girder, and then the thickness of the shoulder is cut into the trimmer, also levelling upwards, that it may just receive the gain, and so the joist and trimmer lie even and level with the surface.

This way of working is used in floors and hearths.

GALANGALS, *Galanga*, in the materia medica, the name of two roots kept in the shops, a greater and a smaller; of which the smaller is by far the most esteemed.

The lesser galangal is a small and short root, of an irregular figure, and of the thickness of a man's little finger, seldom met with more than an inch or two long. It should be chosen full and plump, of a bright colour, very firm and sound, and of an acrid and insupportably hot taste.

The larger galangal is brought to us in pieces of two inches or a little more in length, and of near an inch in thickness: its surface is less unequal and tuberose than the smaller sort, but is far from being smooth; on the outside it is of a brown colour, with a very faint cast of red, and within it is of a paler colour, and has a much less acrid and pungent taste than the smaller kind. It is to be chosen in the largest, soundest, and heaviest pieces.

The roots of both the galangals, but particularly of the lesser, abound with a volatile, oily, aromatic salt; the lesser is esteemed an excellent stomachic: it has the credit of being a great cephalic, cardiac, and uterine, but is more particularly recommended in vertigos. The greater galangal possesses the same virtues, but in a less degree.

GALANTHUS, the snow-drop, in botany, a bulbous rooted plant, whose flower consists of three oblong concave petals, which spread open and are equal; the nectarium is obtuse, cylindrical, and indented; the stamina are six short filaments, topped with oblong acuminated antheræ, inclining together; and the fruit is an oval capsule obtusely trigonal, with three cells, which are filled with a number of roundish seeds. The snow-drop being one of the first flowers which blow in the spring, it therefore well deserves a place in gardens, particularly a variety with a double nectarium.

GALAXY, in astronomy, the via lactea, or milky way in the heavens: a tract of a whitish colour, and considerable breadth, which runs through a great compass of the heavens, sometimes in a double, but for the greatest part of its course in a single stream; and is composed of a vast number of stars, too minute or too remote from the earth to be distinguished by the naked eye; but are discovered in all parts of it, in great numbers, by the assistance of the telescope.

GALBANUM, in pharmacy, a gum issuing from the stem of an umbelliferous plant, growing in Persia and many parts of Africa.

It is sometimes met with in the shops in loose granules, called drops or tears, and sometimes in large masses, formed of a number of these blended together; but in these masses some accidental foulness is often mixed with the gum. The single drops usually approach to a roundish, oblong, pear-like form. Galbanum is soft like wax, and, when fresh drawn, white; but it afterwards becomes yellowish or reddish: it is of a strong smell, of an acrid and bitterish taste; it is inflammable in the manner of a resin, and soluble in water like a gum.

It attenuates and dissolves tough phlegm, and is therefore of service in asthmas and inveterate coughs: it is also of great service in hysteric complaints; it dissipates flatulencies, promotes the menses, and facilitates delivery and the expulsion of the secundines. It is given in pills and electuaries, and is used externally in form of a plaster, applied to the belly, against habitual hysteric complaints, and on many other occasions.

GALENIC, or GALENICAL, in pharmacy, a manner of treating diseases founded on the principles of Galen.

The distinction of galenical and chemical was occasioned

caſioned by a diviſion of the practitioners of medicine into two ſects, which happened on the introduction of chemiſtry into medicine; then the chemiſts arrogating to themſelves every kind of merit and ability, ſtirred up an oppoſition to their pretenſions, founded on the invariable adherence of the other party to the ancient practice. And though this diviſion into the two ſects of galeniſts and chemiſts has long ceaſed, yet the diſtinction of medicines, which reſulted from it, is ſtill retained.

Galenical medicines are thoſe which are formed by the eaſier preparations of herbs, roots, &c. by infuſion, decoction, &c. and by combining and multiplying ingredients; while thoſe of chemiſtry draw their more intimate and remote virtues by means of fire and elaborate preparations, as calcination, digeſtion, fermentation, &c.

GALENISTS, in church hiſtory, a branch of anabaptiſts, who are ſaid to have adopted ſeveral Arian opinions concerning the divinity of our Saviour.

GALILEANS, a ſect of Jews. Their founder was one Judas, a native of Galilee, from which place they derived their name. Their chief, eſteeming an indignity for the Jews to pay tribute to ſtrangers, raiſed up his countrymen againſt the edict of the emperor Auguſtus, which had ordered a taxation or enrollment of all the ſubjects of the Roman empire.

They pretended that God alone ſhould be owned as maſter and lord; and in other reſpects were of the opinion of the Phariſees: but as they judged it unlawful to pray for infidel princes, they ſeparated themſelves from the reſt of the Jews, and performed their ſacrifices apart.

GALL, in the animal œconomy, the ſame with bile. See BILE and BILIOUS.

GALL-BLADDER, called veſicula, and cyſtis fellea, is uſually of the ſhape of a pear, and of the ſize of a ſmall hen's egg. It is ſituated in the concave ſide of the liver, and lies upon the colon, part of which it tinges with its own colour. It is compoſed of four membranes, or coats; the common coat, a veſicular one, a muſcular one (conſiſting of ſtraight, oblique, and tranſverſe fibres) and a nervous one, of a wrinkled or reticulated ſurface within, and furniſhed with an unctuous liquor.

The uſe of the gall-bladder is to collect the bile, firſt ſecreted in the liver, and mixing it with its own peculiar produce, to perfect it farther, to retain it together a certain time, and then to expel it.

GALL, in natural hiſtory, denotes any protuberance or tumour produced by the puncture of inſects on plants and trees of different kinds.

Theſe galls are of various forms and ſizes, and no leſs different with regard to their internal ſtructure. Some have only one cavity, and others a number of ſmall cells communicating with each other. Some of them are as hard as the wood of the tree they grow on, whilſt others are ſoft and ſpongy; the firſt being called gall-nuts, and the latter berry-galls, or apple-galls.

The general hiſtory of galls is this: an inſect of the fly-kind is inſtructed by nature to take care for the ſafety of her young, by lodging her eggs in a woody ſubſtance, where they will be defended from all injuries: ſhe, for this purpoſe, wounds the branches of a tree; and the lacerated veſſels, diſcharging their contents, ſoon form tumours about the holes thus made. The hole in each of theſe tumours, through which the fly has made its way, may for the moſt part be found; and when it is not, the maggot-inhabitant or its remains are ſure to be found within, on breaking the gall. However, it is to be obſerved, that in thoſe galls which contain ſeveral cells, there may be inſects found in ſome of them, though there be a hole by which the inhabitant of another cell has eſcaped.

Oak-galls put, in a very ſmall quantity, into a ſolution of vitriol in water, though but a very weak one, give it a purple or violet colour; which, as it grows ſtronger, becomes black; and on this property depends the art of making our writing-ink, as alſo a great deal of thoſe of dyeing and dreſſing leather, and other manufactures.

In medicine, galls are found to be very aſtringent, and good, under proper management, in diarhœas, dyſenteries, and hæmorrhages of all kinds; they have alſo a very eminent virtue as a febrifuge. Half a dram, or more, of the powder of Aleppo galls, may be given for a doſe, and will often cure an intermittent fever. They are alſo uſed externally by way of fomentation in procidentiæ of the anus: and a decoction of them has been injected in the fluor albus with great ſucceſs.

GALLEASSES, in the marine, the largeſt ſort of armed veſſels next to ſhips of war: they are a ſort of ſhip of one deck and three maſts; and are uſed by the Venetians only: they have thirty-two banks of oars, with ſix or ſeven ſlaves to an oar; three batteries of guns from thirty-ſix to twenty-four pounders; their complement of men conſiſts of a thouſand or twelve hundred. To ſee one of theſe galleaſſes at ſea, ſhe appears like a great floating iſland, able in appearance to encounter with twenty galleons (ſee the next article). The Turks have ſhips not unlike them, which they call mahones.

GALLEON was formerly a name given to ſhips of war which had three or four decks. The name is now no longer in uſe but with the Spaniards, which they give to their ſhips which are deſtined for Weſt-India voyages. Theſe ſhips, which are of a larger ſize, have always four decks. They give alſo the ſame name to greater or ſmaller veſſels, which go yearly to La Vera Cruz. The Portugueſe have ſhips which they call caragues, ſomewhat reſembling the galleon, which they ſend to India and the Brazils.

GALLERY *of a Ship*, a ſort of raiſed balcony, without the cabin, at the ſtern or quarter of a ſhip, for the convenience of the commander.

GALLERY, in architecture, a covered place in a houſe, much longer than broad, and uſually in the wings of a building, its uſe being chiefly to walk in.

GALLERY, in fortification, a covered walk acroſs the ditch of a town, made of ſtrong beams, covered over head with planks, and loaded with earth: ſometimes it is covered with raw hides, to defend it from the artificial fires of the beſieged. Its ſides ſhould be muſket proof. It ought to be eight feet high, and ten or twelve wide, and the covering to riſe with a ridge, that what is thrown upon it by the beſiegers with a deſign to burn it, may roll off.

Galleries are chiefly uſed to ſecure and facilitate the miners approach to the face of the baſtion, over the moat, which is already ſuppoſed to be filled up with faggots and bavins, and the artillery of the oppoſite flank diſmounted.

GALLERY *of a Mine*, is a narrow paſſage, or branch of a mine, carried on underground to a work deſigned to be blown up.

Both the beſiegers and the beſieged alſo, carry on galleries in ſearch of each other's mines, and theſe ſometimes meet and deſtroy each other.

GALLERY, in gardening, a kind of covered walk in a garden, formed into porticoes or arches, with trees of different ſorts; but in the preſent practice is much in diſuſe.

GALLEY, a kind of low flat-built veſſel, with one deck, made either to ſail or row: they are from an hundred and twenty, to an hundred and thirty feet long, eighteen feet broad, and nine or ten feet deep. They have two maſts which can be ſtruck at pleaſure, two lateen ſails, and five pieces of cannon. The galleys have commonly twenty-five or thirty banks of oars on either ſide, to each of which are chained five or ſix ſlaves. There are no gallies now but in the Mediterranean: they commonly keep cloſe along ſhore, though they ſometimes venture out to ſea for a ſhort cruize.

GALLIAMBIC VERSE, *Galliambus*, in ancient poetry, a verſe conſiſting of ſix feet, viz. an anapeſt, or a ſpondee; an iambus, or an anapeſt, or a tribrach; an iambus; a dactyl; a dactyl; an anapeſt.

The word galliambus is a compound of iambus and gallus, a prieſt of Cybele. Theſe prieſts carried about the image of that goddeſs, in order to get alms, and as a part of their employment was ſinging verſes all over the country, they, by this means, rendered poetry very deſpicable.

GALLI, in antiquity, the prieſts of the goddeſs Cybele, who were eunuchs, and took their name from Gallus, a river in Phrygia.

GALLICAN, any thing belonging to France: thus the term Gallican-church, denotes the church of France, or the aſſembly of the clergy of that kingdom. See CHURCH.

GALLINÆ, in ornithology, an order of birds, the beak of which is conic, and ſomewhat incurvated, and the upper chap imbricated.

Under this order are comprehended the oſtrich, peacock, pheaſant, woodcock, turkey, the common dunghill-cock, partridge, &c.

GALLINACEOUS, an appellation given to birds of the order of the gallinæ.

GALLING, or EXCORIATION, in medicine. See EXCORIATION.

GALLING *of a Horſe's Back*, a diſorder occaſioned by heat, and the chafing or pinching of the ſaddle.

In order to prevent it, ſome take a hind's ſkin well garniſhed with hair, and fit it neatly under the pannel of the ſaddle, ſo that the hairy ſide may be next the horſe.

When a horſe's back is galled upon a journey, take out a little of the ſtuffing of the pannel over the ſwelling, and ſew a piece of ſoft white leather on the inſide of the pannel; anoint the part with ſalt butter, and every evening wipe it clean, rubbing it till it grow ſoft, anointing it again with butter, or, for want of that, with greaſe: waſh the ſwelling, or hurt, every evening with cold water and ſope, and ſtrew it with ſalt, which ſhould be left on till the horſe be ſaddled in the morning.

GALLIUM, ladies-bedſtraw, in botany, a genus of plants, the flower of which is a quadrifid ſingle petal, without any tube, and placed flatwiſe: the fruit conſiſts of two globoſe bodies, growing cloſe together, but not adhering, and containing each a ſingle kidney-ſhaped ſeed. It is ſaid to be an excellent aſtringent.

GALLON, a meaſure of capacity both for dry and liquid things, containing four quarts; but theſe quarts, and conſequently the gallon itſelf, are different, according to the quality of the thing meaſured: for inſtance, the wine gallon contains 231 cubic inches, and holds eight pounds averdupois of pure water: the beer and ale gallon contain 282 ſolid inches, and holds ten pounds three ounces and a quarter averdupois of water; and the gallon for corn, meal, &c. 272¼ cubic inches, and holds nine pounds thirteen ounces of pure water.

GALLOON, in commerce, a narrow thick kind of ferret, or lace, uſed to edge or border cloaths, ſometimes made of wool, and at others of gold or ſilver.

GALLOP, in the manege, a motion of a horſe that runs at full ſpeed; in which, making a kind of leap forwards, he lifts both his fore-legs almoſt at the ſame time; when theſe are in the air, juſt upon the point of touching the ground, he lifts both his hind-legs almoſt at once.

GALLOWS *of a Plough*, a part of the plough

head, ſo called by farmers, from its reſemblance to the common gallows, as conſiſting of three pieces of timber, whereof one is placed tranſverſely over the heads of the other two. See PLOUGH.

GALLUS, the COCK, in ornithology, a well known domeſtic fowl, the head of which is ornamented with a longitudinal fleſhy creſt, or comb: the wattles are two, and placed longitudinally on the throat. This, in its natural ſtate, is a very robuſt and beautiful bird, variegated with a great number of elegant colours.

GALLY, in printing, a frame into which the compoſitor empties the lines out of his compoſing-ſtick, and in which he ties up the page when it is completed.

The gally is formed of an oblong ſquare board, with a ledge on three ſides, and a groove to admit a falſe bottom, called a gally-ſlice.

GAMBOGE, is a concreted vegetable juice, the produce of two trees, both called by the Indians caracapulli, and is partly of a gummy, and partly of a reſinous nature. It is brought to us either in form of orbicular maſſes, or of cylindrical rolls of various ſizes; and is of a denſe, compact, and firm texture, and of a beautiful yellow. It is chiefly brought to us from Cambaja, in the Eaſt-Indies, called alſo Cambodja, and Cambogia; and from thence it has obtained its names of cambadium, cambogium, and gambogium.

It is a very rough and ſtrong purge; it operates both by vomit and ſtool, and both ways with much violence, almoſt in the inſtant in which it is ſwallowed; but yet without griping. It requires caution and judgment in adminiſtring it; but thoſe who know how to give it properly, find it an excellent remedy in dropſies, cachexies, jaundice, aſthmas, catarrhs, and in the worſt cutaneous eruptions.

Its doſe is from two or three grains, to ſix, eight, or ten: four grains generally operate briſkly without vomiting, and eight or ten grains uſually vomit briſkly, and afterwards purge downwards.

It is at preſent much more eſteemed by painters in water-colours, than by phyſicians.

GAME, *Ludus*, in general, ſignifies any diverſion, or ſport, that is performed with regularity, and reſtrained to certain rules. See the article GAMING.

GAMES, *Ludi*, in antiquity, were public diverſions, exhibited on ſolemn occaſions. Such, among the Greeks, were the Olympic, Pythian, Iſthmian, Nemæan, &c. games; and, among the Romans, the Apollinarian, Circenſian, Capitoline, &c. games. See the articles OLYMPIC, PYTHIAN, &c.

GAMELIA, γαμήλια, in Grecian antiquity, a nuptial feaſt, or rather ſacrifice, held in the ancient Greek families on the day before marriage; thus called, from a cuſtom they had of ſhaving themſelves on this occaſion, and preſenting their hair to to ſome deity to whom they had particular obligations.

GAMELION, a poem or compoſition in verſe on the ſubject of a marriage, commonly called epithalamium. See EPITHALAMIUM.

GAMING, the art or act of performing or practiſing any game, particularly a game of hazard, and this generally for ſtakes or a ſum of money. See *Laws of* CHANCE.

GAMMUT, GAM, GAMMA, or GAMMAUT, in muſic, a ſcale whereon we learn to ſound the muſical notes, *ut, re, mi, fa, ſol, la*, in their ſeveral orders and diſpoſitions. See NOTE and SCALE.

The invention of this ſcale is owing to Guido Aretine; though it is ſo properly an invention as an improvement on the diagram, or ſcale of the Grecians. See the article DIAGRAM.

The gammut is alſo called the harmonical hand, by reaſon that Guido made firſt uſe of the figure of the hand to demonſtrate the progreſſion of his ſounds.

Guido, finding the diagram of the ancients of too ſmall an extent, added five more chords or notes to it; one below the proſlambanomenos of the ancients, and four above the hyperbolæon. The firſt he called hypoproſlambanomenos, and denoted it by the letter G, or the Greek Γ, gamma; which note being at the head of the ſcale, occaſioned the whole ſcale to be called by the name of gamm, or gammut. This ſcale is divided into three ſeries or columns, the firſt called durum, the ſecond natural, and the third molle, &c.

GAMMUT, or GAMM, is alſo the firſt or graveſt note in the modern ſcale of muſic, the reaſon of which is ſhewn under the preceding article.

GANDER, in ornithology, the male of the gooſe kind; one of which, it is ſaid, will ſerve five geeſe. See GOOSE.

GANGLIO, or GANGLION, in ſurgery, a hard tubercle, generally moveable, in the external or internal part of the carpus, upon the tendons or ligaments in that part, uſually without any pain to the patient. Though ganglions ſo nearly reſemble an encyſted tumour, that Celſus makes them one and the ſame; yet their differences may appear, if it were only from their different ſeats; ganglions being confined to the tendons and ligaments of the hands and feet, whereas encyſted tumours are not reſtrained to any part of the body. See the article ENCYSTED.

With regard to to cauſe of ganglions, they ſeem generally to proceed from an inſpiſſation of the viſcid juices, which are let out, and lodged betwixt the fibres and membranes, when the tendons and ligaments of thoſe parts have been injured by a fall, blow, ſtrain, contuſion, or the like, in which caſe they gradually increaſe more or leſs, as long as the fibres yield; the juices find vent ſo as to advance to the

the size of a filbert, walnut, or even a pigeon's egg: some are oblong, round, or oval, with an equal or uneven surface; some of them which are recent, may be easily dispersed; and others, which have been of long standing, hardly yield to any remedies but the knife.

The inspissated matter of a recent ganglion may often be happily dispersed by barely rubbing the tumour well every morning with the fasting saliva, and binding a plate of lead on it afterwards for several weeks successively. Many attribute a greater discutient virtue to the lead, when it has first had some mercury rubbed on it. Forestus, and others, advise the use of a plaster of ammoniac and mercury, and often to rub them with oil of soap. Others write, that a cure may be readily performed, if the patient lays his hand upon a table, and strikes on the tumour with his fist: but care should be taken not to injure the bones, tendons, or other parts of the hand, in striking the tumour; and the same care must be taken if there is a necessity of having recourse to caustics or incision, in order to remove them.

GANGRENE, a very great and dangerous degree of inflammation, wherein the parts affected begin to corrupt, and put on a state of putrefaction. A gangrene is distinguished from a sphacelus, inasmuch as this latter is not an incipient but an absolute and perfect corruption, or death of the parts, already made. See the article SPHACELUS.

A gangrene may be discovered generally from the following signs; namely, the inflammation, with its symptoms, which have all along been very violent, do generally undergo a sudden change, as if they were going off. The parts which were before swelled and tense, do now grow soft and flaccid, and upon pressing with the finger on the skin and fat, its impression remains behind, as in an œdema; at length the cuticula separates from the cutis, often rising up in blisters, like those on burns, filled with a reddish, yellowish, and black humour; and the sense of the limb is in some degree diminished. See the article OEDEMA.

A gangrene is for the generality never without danger, because it easily changes into a sphacelus, or intire mortification, which never admits of cure but by taking off the dead parts. But a gangrene which is slight, incipient, and not spread far, but only affects the skin and fat, is not very difficult to cure; especially when it happens in a young and stout patient, in a mild and temperate season, and does little or no injury to the muscles and nerves: but the larger, more violent, and confirmed is the gangrene, and the faster it spreads, the more difficult it is generally to effect a cure, especially in an old or weak patient; or in an ill habit of body, from a dropsy, phthisis, or scorbutus: the weather also being too hot, or very cold, or the parts affected being near the thorax, or abdomen, may make the case more dangerous. Nor can this case be neglected without the utmost danger of life, or its suddenly turning into a sphacelus.

GANNET, in ornithology, a bird of the larus or gull-kind, frequent on the western coasts of England.

It is equal in size to the common duck. The upper part of the body is of a deep rusty ferrugineous colour, much like that of the common buzzard; and the breast and belly are also brown, but paler. It is an extremely singular species, its whole aspect, in some degree, approaching to that of some of the larger birds of prey.

GANTLET, or GAUNTLET, a large kind of glove, made of iron, and the fingers covered with small plates. It was formerly worn by cavaliers, when armed at all points.

GAOL, a prison, or place of legal confinement.

GAOL-DELIVERY, is where a commission or patent is granted by the king in the nature of a letter, to certain persons, who are thereby appointed his justices; or to two or three of them, authorizing them to deliver his gaol, at such a place, of the prisoners contained therein; and for that end it commands them to meet at such a place, at the time they themselves shall appoint, when the sheriff of the county is commanded to bring all the prisoners in the gaol before them, &c. 4 *Inst.* 168.

GARBLER *of Spices*, an ancient officer in the city of London, who is authorized to go into shops, ware houses, &c. there to view and search drugs, spices, &c. and see that they were garbled or cleansed from the dross and dust wherewith they are mixed.

GARDANT, or GUARDANT, in heraldry, denotes any beast full-faced, and looking right forward.

GARDEN, a plot of ground, cultivated and properly ornamented with a variety of plants, flowers, fruit, &c.

Gardens are usually distinguished into flower-garden, fruit-garden, and kitchen-garden; the first of which, being designed for pleasure and ornament, is to be placed in the most conspicuous part, that is, next to the back front of the house; and the two latter being designed for use, should be placed less in sight. But though the fruit and kitchen-gardens are here mentioned as two distinct gardens, yet they are now usually in one; and that with good reason, since they both require to be placed out of the view of the house. See KITCHIN-GARDEN.

In the choice of a place proper for a garden, the most essential points to be considered are the situation, the soil, the exposure, water, and prospect.

1. As to the situation, it ought to be such a one as is wholesome, and in a place neither too high nor too low; for if a garden be too high, it will be exposed to the winds, which are very prejudicial to trees;

trees; and if it be too low, the dampneſs, the vermin, and the venomous creatures that breed in ponds, and marſhy places, add much to their inſalubrity. The moſt happy ſituation is on the ſide of a hill, eſpecially if the ſlope be eaſy, and in a manner imperceptible; if a good deal of level ground be near the houſe; and if it abounds with ſprings of water; for, being ſheltered from the fury of the winds, and the violent heat of the ſun, a temperate air will be there enjoyed; and the water that deſcends from the top of the hill, either from ſprings or rain, will not only ſupply fountains, canals, and caſcades, for ornament, but when it has performed its office, will water the adjacent valleys, and, if it be not ſuffered to ſtagnate, will render them fertile and wholeſome. Indeed if the declivity of the hill be too ſteep, and the water be too abundant, a garden on the ſide of it may frequently ſuffer, by having the trees torn up by torrents and floods; and by the tumbling down of the earth above, the walls may be demoliſhed, and the walks ſpoiled. It cannot, however, be denied, that the ſituation on a plain, or flat, has ſeveral advantages which the higher ſituation has not: for floods and rain commit no damage; there is a continued proſpect of champaigns, interſected by rivers, ponds, and brooks, meadows and hills, covered with woods or buildings; beſides, the level ſurface is leſs tireſome to walk on, and leſs chargeable, than that on the ſide of a hill, ſince terrace-walks and ſteps are not there neceſſary; but the greateſt diſadvantage of flat gardens, is the want of thoſe extenſive proſpects which riſing grounds afford.

2. A good earth, or ſoil, is next to be conſidered; for it is ſcarce poſſible make a fine garden in a bad ſoil; there are indeed ways to meliorate ground, but they are very expenſive; and ſometimes when the expence has been beſtowed of laying good earth three feet deep over the whole ſurface, a whole garden has been ruined, when the roots of the trees have come to reach the natural bottom.

To judge of the quality of the ſoil, obſerve whether there be any heath, thiſtles, or ſuch like weeds, growing ſpontaneouſly in it; for they are certain ſigns that the ground is poor. Or if there be large trees growing thereabouts, obſerve whether they grow crooked, ill-ſhaped, and grubby; and whether they are of a faded green, and full of moſs, or infeſted with vermin; if this be the caſe, the place is to be rejected: but, on the contrary, if it be covered with good graſs fit for paſture, you may then be encouraged to try the depth of the ſoil. To know this, dig holes in ſeveral places, ſix feet wide, and four feet deep; and if you find three feet of good earth, it will do very well; but leſs than two will not be ſufficient. The quality of good ground is neither to be ſtony, nor too hard to work; neither too dry, too moiſt, nor too ſandy and light; nor too ſtrong and clayey, which is the worſt of all for gardens.

3. The next requiſite is water, the want of which is one of the greateſt inconveniences that can attend a garden, and will bring a certain mortality upon whatever is planted in it, eſpecially in the greater droughts that often happen in a hot and dry ſituation in ſummer; beſides its uſefulneſs in fine gardens for making fountains, canals, caſcades, which are the greateſt ornaments of a garden.

4. The laſt thing to be conſidered is the proſpect of a fine country; and though this is not ſo abſolutely neceſſary as water, yet it is one of the moſt agreeable beauties of a fine garden: beſides, if a garden be planted in a low place that has no kind of proſpect, it will not only be diſagreeable, but unwholeſome.

In the laying out and planting of gardens, the beauties of nature ſhould always be ſtudied; for the nearer a garden approaches to nature, the longer it will pleaſe. The area of a handſome garden may take up thirty or forty acres, but not more; and the following rules ſhould be obſerved in the diſpoſition of it:—There ought always to be a deſcent at leaſt three ſteps from the houſe to the garden; this will render the houſe more dry and wholeſome, and the proſpect on entering the garden more extenſive. The firſt thing that ſhould preſent itſelf to view, ſhould be an open lawn of graſs, which ought to be conſiderably broader than the front of the building; and if the depth be one-half more than the width, it will have a better effect: if on the ſides of the lawn there are trees planted irregularly, by way of open groves the regularity of the lawn will be broken, and the whole rendered more like nature. For the convenience of walking in damp weather, this lawn ſhould be ſurrounded with a gravel walk, on the outſide of which ſhould be borders, three or four feet wide, for flowers: and from the back of theſe, the proſpect will be agreeably termined by a ſlope of ever-green ſhrubs, which, however, ſhould never be ſuffered to exclude agreeable proſpects, or the view of handſome buildings. Theſe walks may lead through the different plantations, gently winding about in an eaſy natural manner, which will be more agreeable than either thoſe long ſtraight walks, too frequently ſeen in gardens, or thoſe ſerpentine windings, that are twiſted about into ſo many ſhort turns, as to render it difficult to walk in them: and as no garden can be pleaſing where there is a want of ſhade or ſhelter, theſe walks ſhould lead as ſoon as poſſible into plantations, where perſons may walk in private, and be ſheltered from the wind. Where the borders of the gardens are fenced with walls or pales, they ſhould be concealed with plantations of flowering-ſhrubs intermixed with laurels and other ever-greens, which will have a good effect, and at the ſame time conceal the fences, which are diſagreeable, when left naked and expoſed to the ſight.

Groves

Groves are the moſt agreeable parts of a garden, ſo that there cannot be too many of them; only that they muſt not be too near the houſe, nor be ſuffered to block up agreeable proſpects. To accompany parterres, groves opened in compartments, quincunxes, and arbour-work with fountains, &c. are very agreeable. Some groves of ever-greens ſhould be planted in proper places, and ſome ſquares of trees of this kind may alſo be planted among the other wood. See QUINCUNX, &c.

Narrow rivulets, if they have a conſtant ſtream, and are judiciouſly led about a garden, have a better effect than many of the large ſtagnating ponds or canals ſo frequently made in large gardens. When wilderneſſes are intended, they ſhould not be cut into ſtars and other ridiculous figures, nor formed into mazes or labyrinths, which in a great deſign appear triſling. Buildings, ſtatues, and vaſes, appear very beautiful; but they ſhould never be placed too near each other: magnificent fountains are alſo very ornamental; but they ought never to be introduced, except there be water to keep them conſtantly running. The ſame may alſo be obſerved of caſcades and other falls of water. See the articles CASCADE, FOUNTAIN, &c.

In ſhort, the ſeveral parts of a garden ſhould be diverſified; but in places where the eye takes in the whole at once, the two ſides ſhould be always the ſame. In the buſineſs of deſigns, the aim ſhould be always at what is natural, great, and noble. The general diſpoſition of a garden, and of its parts, ought to be accommodated to the different ſituations of the ground, to humour its inequalities, to proportion the number and ſorts of trees and ſhrubs to each part, and to ſhut out from the view of the garden no objects that may become ornamental. And before a garden is planned out, it ought ever to be conſidered, what it will be when the trees have had twenty years growth. *Miller's Gard. Dict.*

GARDENING, a branch of agriculture, containing the cultivation of gardens.

The art of gardening teaches how to lay out properly the different parts of a garden ſo as to make it not only the moſt uſeful, but alſo the moſt convenient and ornamental according to its ſituation; it likewiſe ſhews how to prepare and adapt the various kinds of ſoil for ſowing and planting the different kinds of ſeeds, trees, &c. as alſo their proper ſeaſons of ſowing and managing when growing up, according to their ſeveral natures; with the divers methods of increaſing and propagating plants, whether by cuttings, layers, grafting, inoculation, &c.

As to the ſeveral parts and operations of gardening, ſee them deſcribed under their reſpective articles, as SOWING, PLANTING, TRANSPLANTING, GRAFTING, INOCULATION, PRUNING, NURSERY, HOT-BED, GREEN-HOUSE, WALK, TERRACE, ALLEY, AVENUE, ARBOUR, GROVE, ESPALIERS, STANDARDS, &c.

GARCINIA, in botany, a tree which riſes with an upright ſtem to about twenty feet high; the branches are placed oppoſite, in pairs, ſtanding oblique to each other; the leaves are ſpear-ſhaped and entire, of a bright green on their upper ſide, and olive-coloured underneath, and about ſeven or eight inches long. The flower is roſaceous, conſiſting of four roundiſh patent petals of a dark red colour, with ſixteen erect ſtamina. The fruit is a large unilocular coriaceous berry, containing eight hairy and fleſhy ſeeds, which are convex on one ſide, angular on the other, and ſurrounded with a ſoft juicy pulp of a delicious flavour, partaking of the ſtrawberry and grape, which makes it one of the richeſt fruits in the world. This tree is a native of the inland parts of Mexico and the Molucca iſlands, and is ſometimes called mangoſtan.

GARGARISM, in medicine, is ſometimes taken, in a large ſenſe, for every collution of the mouth; but, ſtrictly ſpeaking, it ſignifies a liquid medicine, appropriated to affections of the mouth, gum, fauces, larynx, and ſometimes of the head, received into the mouth, and there uſed by way of collution, without deglutition.

GARIDELLA, in botany, a genus of decandrious plants; it hath no flower petals, but, in their ſtead, are placed five long equal and bilabiated nectaria. The fruit conſiſts of three oblong compreſſed acuminated capſules, formed of two valves incloſing ſeveral ſmall ſeeds.

GARLAND, among ſailors, a ſort of net uſed by the different meſſes of a ſhip of war to hang their proviſions in, in the apartment where they eat and ſleep.

GARLIC, *Allium*, in botany, a plant with a bulbous root, conſiſting of ſeveral membranes, and is of a whitiſh colour with a purpliſh caſt; the leaves are oblong, and not ſiſtulous as thoſe of the onion, but in their general characters they agree, and are therefore claſſed by Linnæus together. See ONION.

Garlic is eaſily propagated, by planting their cloves or ſmall bulbs in the ſpring, in beds about four or five inches aſunder; in the middle of June the leaves ſhould be tied in knots to prevent their running to ſeed, and then the bulb will be greatly enlarged: towards the end of July the leaves will begin to wither, and then the root ſhould be taken out of the ground, and hung up in a dry room.

Garlic is proper to warm and ſtimulate the ſolids, and to diſſolve the groſs clammy fluids, whence it is good in cold conſtitutions and in moiſt aſthmas, as well as all defluxions of the breaſt; it is likewiſe very diuretic, as appears by its ſmell in the urine, and upon that account is ſerviceable in dropſies, for it will ſometimes cure it without any other medicine; but it ſhould be avoided in all inflammatory diſpoſitions and hot diſeaſes.

GARNET, among ſailors, a ſort of tackle or com-

complication of pullies, fixed to the main-ſtay of a merchant-ſhip to hoiſt the cargo in and out at the time of lading and delivering her.

Alſo a rope fixed to the lower corners or clues of the main-ſail and fore-ſail to draw them up to the yard occaſionally, and hence called clue-garnet. See the article CLUE-GARNET.

GARNET, *Granatus*, in natural hiſtory, a very beautiful gem, of a red colour, with an admixture of bluiſh.

When pure and free from blemiſhes, it is little inferior, in appearance, to the oriental ruby, tho' only of a middle degree of hardneſs between the ſapphire and common cryſtal. It is found of various ſizes, from that of a pin's head to an inch in diameter.

Among our lapidaries and jewellers, genuine garnets are known by different names, according to their different degrees of colour. 1. The garnet, ſimply ſo called, is the fineſt and moſt valuable kind, being of a very deep blood-red, with a faint admixture of blue. 2. The rock-ruby, a name very improperly given to the garnet, when it is of a very ſtrong but not deep red, and has a fairer caſt of the blue: this is a very beautiful gem. 3. The forane or ferain garnet, that of a yet brighter red, approaching to the colour of native cinnabar, with a faint blue tinge. 4. The almandine, a garnet only a little paler than that called the rock-ruby.

Garnets are very properly diſtinguiſhed into the oriental and occidental kinds, as being found in Europe as well as the Eaſt-Indies. The oriental ones are principally brought from Calicut, Cananor, and Cambay; and the European ones are common in Italy, Hungary, and Bohemia.

Some authors have ſuppoſed the deeper-coloured garnet to be the ſame with the carbuncle of the antients, from which it really differs; ſince, on receiving the ſun's beams, it never gives ſo true a fire-colour as the carbuncle. See CARBUNCLE.

GARRISON, in the art of war, a body of forces, diſpoſed in a fortreſs, to defend it againſt the enemy, or to keep the inhabitants in ſubjection; or even to be ſubſiſted during the winter ſeaſon; hence, garriſon and winter-quarters are ſometimes uſed indifferently for the ſame thing; and ſometimes they denote different things. In the latter caſe, a garriſon is a place wherein forces are maintained to ſecure it; and where they keep regular guard, as a frontier town, a citadel, caſtle, tower, &c. The garriſon ſhould always be ſtronger than the townſmen.

Winter-quarters ſignify a place where a number of forces are laid up in the winter ſeaſon, without keeping the regular guard. See WINTER-QUARTERS.

GARRISON-TOWN, a ſtrong place in which troops are quartered, and do duty, for the ſecurity thereof, keeping ſtrong guards at each port, and a main guard in the market-place.

Order of the GARTER, a military order of knighthood, the moſt noble and ancient of any lay-order in the world, inſtituted by king Edward III. This order conſiſts of twenty-ſix knights companions, generally princes and peers, whereof the king of England is ſovereign or chief. They are a college or corporation, having a great and little ſeal.

Their officers are a prelate, chancellor, regiſter, king at arms, and uſher of the black rod. They have alſo a dean with twelve canons, and petty canons, vergers, and twenty-ſix penſioners or poor knights. The prelate is the head. This office is veſted in the biſhop of Wincheſter, and has ever been ſo. Next to the prelate is the chancellor, which office is veſted in the biſhop of Saliſbury, who keeps the ſeals, &c. The next is the regiſter, who by his oath is to enter upon the regiſtry the ſcrutinies, elections, penalties, and all other acts of the order, with all fidelity. The fourth officer is garter, and king at arms, being two diſtinct offices united in one perſon. Garter carries the rod and ſcepter at the feaſt of St. George, the protector of this order, when the ſovereign is preſent. He notifies the elections of new knights, attends the ſolemnity of their inſtallations, carries the garter to the foreign princes, &c. He is the principal officer within the college of arms, and chief of the heralds. See KING *at Arms*.

All theſe officers, except the prelate, have fees and penſions. The college of the order is ſeated in the caſtle of Windſor, with the chapel of St. George, and the chapter-houſe, erected by the founder for that purpoſe. The habit and enſign of the order are a garter, mantle, cap, george, and collar. The four firſt were aſſigned the knights companions by the founder; and the george and collar by Henry VIII. The garter challenges preheminence over all the other parts of the dreſs, by reaſon that from it the noble order is denominated; that it is the firſt part of the habit preſented to foreign princes, and abſent knights, who, and all other knights elect, are therewith firſt adorned; and it is of ſo great honour and grandeur, that by the bare inveſtiture with this noble enſign, the knights are eſteemed companions of the greateſt military order in the world. It is worn on the left leg between the knee and calf, and is enamelled with this motto, HONI SOIT QVI MAL Y PENSE; i. e. "Shame to him that thinks evil hereof." The meaning of which is, that king Edward having laid claim to the kindom of France, retorted ſhame and defiance upon him that ſhould dare to think amiſs of the juſt enterpriſe he had undertaken, for recovering his lawful right to that crown; and that the bravery of thoſe knights whom he had elected into this order,

was

was ſuch as would enable him to maintain the quarrel againſt thoſe that thought ill of it.

The mantle is the chief of thoſe veſtments made uſe of upon all ſolemn occaſions. The colour of the mantle is by the ſtatutes appointed to be blue. The length of the train of the mantle only diſtinguiſhes the ſovereign from the knights companions. To the collar of the mantle is fixed a pair of long ſtrings, anciently wove with blue ſilk only, but now twiſted round, and made of Venice gold and ſilk, of the colour of the robe, with knobs, or buttons, and taſſels at the end. The left ſhoulder of the mantle has from the inſtitution been adorned with a large garter, with the device HONI SOIT, &c. Within this is the croſs of the order, which was ordained to be worn at all times by king Charles I. At length the ſtar was introduced, being a ſort of croſs, irradiated with beams of ſilver.

The collar is appointed to be compoſed of pieces gold in faſhion of garters, the gound enamelled blue, and the motto gold. See COLLAR.

The manner of electing a knight companion into this moſt noble order, and the ceremonies of inveſtiture, are as follow:

When the ſovereign deſigns to elect a companion of the garter, the chancellor belonging to this order draws up the letters, which paſſing both under the ſovereign's ſign manual and ſignet of the order, are ſent to the perſon by garter principal king at arms, and are in this manner, or to the ſame effect:—"We, with the companions of our moſt noble order of the garter, aſſembled in chapter, holden this preſent day at our caſtle at Windſor, conſidering the virtuous fidelity you have ſhewn, and the honourable exploits you have done in our ſervice, by vindicating and maintaining our right, &c. have elected and choſen you one of the companions of our order. Therefore, we require you to make your ſpeedy repair unto us, to receive the enſigns thereof, and be ready for your inſtallation upon the —— day of this preſent month, &c."

The garter, which is of blue velvet bordered with fine gold wire, having commonly the letters of the motto of the ſame, is, at the time of election, buckled upon the left leg, by two of the ſenior companions, who receive it from the ſovereign, to whom it was preſented upon a velvet cuſhion by garter king at arms, with the uſual reverence, whilſt the chancellor reads the following admonition, enjoined by the ſtatutes:—"To the honour of God omnipotent, and in memorial of the bleſſed martyr St. George, tye about thy leg, for thy renown, this noble garter; wear it as the ſymbol of the moſt illuſtrious order, never to be forgotten, or laid aſide; that thereby thou mayeſt be admoniſhed to be courageous, and having undertaken a juſt war in which thou ſhalt be engaged, thou mayeſt ſtand firm, valiantly fight, and ſucceſſively conquer."

The princely garter being thus buckled on, and the words of its ſignification pronounced, the knight elect is brought before the ſovereign, who puts about his neck, kneeling, a ſky-coloured ribbon, whereunto is appendant, wrought in gold within the garter, the image of St. George on horſeback, with his ſword drawn, encountering with the dragon. In the mean time the chancellor reads the following admonition:—"Wear this ribbon about thy neck, adorned with the image of the bleſſed martyr and ſoldier of Chriſt, St. George, by whoſe imitation provoked, thou mayeſt ſo overpaſs both proſperous and adverſe adventures, that having ſtoutly vanquiſhed thy enemies, both of body and ſoul, thou mayeſt not only receive the praiſe of this tranſient combat, but be crowned with the palm of eternal victory."

Then the knight elected kiſſes the ſovereign's hand, thanks his majeſty for the great honour done him, riſes up, and ſalutes all the companions ſeverally, who return their congratulations.

Since the inſtitution of this order, there have been eight emperors, and twenty-eight kings, beſides numerous ſovereign princes, enrolled as companions thereof. Its origin is ſomewhat differently related: the common account is, that it was erected in honour of a garter of the counteſs of Saliſbury, which ſhe dropped dancing with king Edward, and which that prince picked up; but our beſt antiquarians think it was inſtituted on account of the victory over the French at Creſſy, where the king ordered his garter to be diſplayed as a ſignal of the battle.

GAS, among chemiſts, a term made uſe of by Helmont, to ſignify, in general, ſpirit incapable of coagulation, ſuch as proceeds from fermented wine.

GASKET, among ſailors, a ſort of platted cord faſtened to the ſail-yards of a ſhip, to furl or tie up the ſail to the yard: it is uſed by wrapping it round the yard and ſail, the latter of which is rolled up cloſe to the former for that purpoſe.

GASTRO-EPIPLOIC VEIN, a vein that opens into the vena portæ. See VEIN.

GASTRIC, in general, ſomething belonging to the ſtomach. See STOMACH.

GASTRIC JUICE, *gaſtricus ſuccus*, among phyſicians, a thin, pellucid, ſpumous, and ſaltiſh liquor, which continually diſtils from the glands of the ſtomach for the dilution of the food. See the article FOOD.

GASTRIC VESSELS, in anatomy, the arteries and veins of the ſtomach. See the articles ARTERY and VEIN.

GASTROCNEMIUS, in anatomy, the name of two thick, pretty broad, and oblong muſcles, which form a great part of what is called the calf of the leg. They are ſituated laterally with reſpect to each other under the popples.

GASTROCNEMIUS is alſo the name of one of the extenſor-muſcles of the foot.

GAS-

GASTRORAPHY, γαστροραφια, in ſurgery, the operation of ſowing up wounds of the abdomen.

GASTROTOMY, γαστροτομια, in ſurgery, the cutting open the abdomen and uterus, as in the the Cæſarian ſection. See the article CÆSARIAN.

GATE, in architecture, a large door, leading, or giving entrance into a city, town, caſtle, palace, or other conſiderable building: or a place giving paſſage to perſons, horſes, coaches, or waggons, &c. As to their proportion, the principal gates for entrance, through which coaches and waggons are to paſs, ought never to be leſs than ſeven feet in breadth, nor more than twelve, which laſt dimenſion is fit only for large buildings. The height of the gate is to be $1\frac{1}{2}$ of the breadth, and ſomewhat more; but as for common gates in inns, under which waggons go loaded with hay, ſtraw, &c. the height of them may be twice their breadth.

Paled GATES, ſuch as are ſet up in fences for ſhutting up the paſſages into fields, and other incloſures.

Theſe are of two ſorts, either of ſawed or cleft timber.

GATE, in the manege, the going or pace of a horſe.

GAVELET, in law, an ancient and ſpecial ceſſavit uſed in Kent, where the cuſtom of gavelkind continues, by which the tenant, if he withdraws his rent and ſervices due to the lord, forfeits his lands and tenements.

GAVELET, in London, is a writ uſed in the huſtings, given to lords of rents in the city of London.

GAVELKIND, a tenure or cuſtom belonging to lands in the county of Kent, by which the lands of the father are, at his death, equally divided among all his ſons; or the land of a deceaſed brother, in caſe he leaves no iſſue, among all his brethren. This is by ſome called ancient ſocage-tenure; the cuſtom came from our Saxon anceſtors, among whom the inheritance of lands did not deſcend to the eldeſt, but to all the ſons alike; and the reaſon why it was retained in Kent is, becauſe the Kentiſh men were not conquered by the Normans in the time of William I.

The particular cuſtoms attending this tenure are, that the heir at the age of fifteen, may give or ſell his lands in gavelkind; and though the father is attainted of treaſon and felony, and ſuffers death, the ſon ſhall inherit. A wife ſhall be endowed of a moiety of the gavelkind-lands, of which her huſband died ſeized, during her widow-hood. Likewiſe a huſband may be tenant by curteſy of half his wife's lands, without having any iſſue by her; but if he marries again, not having iſſue, he forfeits his tenancy.

GAVELMAN, a tenant liable to pay tribute.

GAVELMED, the duty of mowing graſs, required by the lord of his cuſtomary tenants.

GAUGE, or GAGE. See GAGE.

GAUGE-LINE, on the gauging-rod. See the article GAUGING.

GAUGE-POINT, of a ſolid meaſure, the diameter of a circle, whoſe area is equal to the ſolid content of the ſame meaſure. Thus, the ſolidity of a wine gallon being 231 cubic inches, if you conceive a circle to contain ſo many inches, the diameter of it will be 17.15; and that will be the gauge-point of wine-meaſure. And an ale-gallon, containing 282 cubic inches, by the ſame rule, the gage-point for ale-meaſure will be found to be 19.15. After the ſame manner, may the gauge-point of any foreign meaſure be obtained; and from hence may be drawn this conſequence, that when the diameter of a cylinder, in inches, is equal to the gauge-point of any meaſure, given likewiſe in inches, every inch in length thereof will contain an integer of the ſame meaſure, e. g. in a cylinder whoſe diameter is 17.15 inches, every inch in height contains one entire gallon in wine-meaſure; and in another, whoſe diameter is 18.95 inches, every inch in length contains one ale-gallon.

GAUGER, a king's officer who is appointed to examine all tuns, pipes, hogſheads, and barrels of wine, beer, ale, oil, honey, &c. and give them a mark of allowance, before they are ſold in any place within the extent of his office.

GAUGING, the art of meaſuring the contents of all kinds of veſſels, thereby to determine the quantity of liquids, &c. they contain.

Gauging is a branch of ſtereometry. The principal veſſels that come under its operation are pipes, barrels, rundlets, and other caſks; alſo coolers, fats, backs, ſtills, &c.

The ſolid content of cubical, parallelopipedal, and priſmatical veſſels is found in cubic inches, &c. by multiplying the area of the baſe by the perpendicular altitude. And the area of cylindrical veſſels is found by multiplying the area of the circular baſe by the penpendicular altitude.

Before the content of a caſk can be known, its form or ſhape muſt be conſidered; for though the diameters and length of one caſk may be equal to thoſe of another, yet one of them may contain ſeveral gallons more than the other; and therefore the content of all caſks cannot be found by the ſame rule. Moſt writers, therefore, in treating of this ſubject, have taken it for granted, that every common caſk is in one of the following ſolids, viz.

1. The middle fruſtum of a ſpheroid.
2. The middle fruſtum of a parabolical ſpindle.
3. The middle fruſtum of two parabolical conoids abutting upon one common baſe.
4. The middle fruſtum of two cones abutting upon one common baſe.

Accordingly, they have laid down rules for finding the contents of theſe ſolids, and by thoſe rules they ſuppoſe the content of any caſk may be found.

See the method of finding the area of these figures under their proper articles.

From what has been said, it follows, that if we are not exact in assigning the cask its true form, it is impossible we should ever be exact in ascertaining its contents. Now, it is evident to those conversant in these affairs, that there never was any cask in the shape of any one of those solids whose names they bear, unless it can be supposed that it was affected by chance, the cooper never intending them for such: and though it should be admitted that a cask may approach nearly to the form of such a solid, yet what officer had any rule to direct in ascertaining its true form, or to which of the varieties it belonged? Whence it follows, that the best method of gauging all kinds of casks is to reduce them to cylinders; that is, to find a mean diameter between the head and the bung, whence its content will always be found exceedingly near the truth. The method is this:

To the square of the bung diameter, add the square of the head, and four times the square of the mean diameter; multiply this sum by the length of the cask, and divide by 2154,3 for ale, and by 1764,71 for wine, which will give the content respectively.

GAUGING-*Rule* is an instrument commonly made of box, and sometimes ivory, exactly a foot long, one inch and two-tenths broad, and $\frac{3}{4}$ of an inch thick; it consists of four parts, viz. a rule and three small scales or sliding-piece fitted nicely with grooves to slide in it.

Four-foot GAUGING-*Rod*, a rod usually made of box-wood, and consists of four rules, each a foot long, and about half an inch square, joined together by three brass joints, by which means the rod is rendered four feet long, when the four rules are quite opened, and but one foot in length when they are folded together.

On the first face of this rod is placed a line of inches (and sometimes with it a line of ale areas) decimally divided, whose use is to take dimentions necessary for gauging vessels either for ale, wine, malt, &c.

Two diagonal lines are placed near the line of inches, one for ale, the other for wine.

The diagonal line of a cask is found by putting the rod in at the bung to the intersection of the head of the vessel, with the staves opposite to the bung-hole.

By the bung, head, and length of a cask, we can find its diagonal line; whence, by having the contents of two similar casks, and the diagonal of one of them given, we can find the diagonal line of the other; for as the content of any cask, in ale or wine gallons, is to the cube of its diagonal, so is the content of any other cask (similar to the former) to the cube of its diagonal, whose cube-root is the diagonal required.

Lines adapted to the London casks are placed on the other faces of this four-foot gauging-rod, viz. 1. a line for a butt standing; 2. for a butt lying, each of which contains 108 gallons, beer-measure; 3. a line for a hogshead, containing 54 gallons; 4. a line for the barrel of 36 gallons; 5. a line for a kilderkin of 18 gallons; 6. a line for a firkin of nine gallons. Then, to gauge any of these casks, there is no more to do than to put in your rod perpendicular at the bung, &c. and if the cask is not full it gives you the quantity of liquor in the cask.

For the same purpose there are also lines put on four-foot gauging-rods for wine-measure; as 1. a tun of 252 gallons; 2. a butt of 126 gallons; 3. a puncheon of 84 gallons; 4. a hogshead of 63 gallons; 5. a tierce of 42 gallons; 6. a barrel of $31\frac{1}{2}$ gallons; 7. a rundlet of 18 gallons; and, lastly, an anchor of 10 gallons; by these lines all brandies and oils are gauged.

These lines for London casks are made by setting the vessel level, and pouring in one gallon of water, and then put the rod downright into the bung-hole (if it is a lying cask) or at the head (if a standing cask) and where the surface of the water cuts the rods, make the division for one gallon; then pour in another gallon, and where the surface of the water cuts the rod, make divisions for two gallons; proceed thus by pouring in one gallon successively after another, and make divisions at every place on the face of the rod, to which the water rises, till the cask be full, and then you have the scale for that cask properly divided. Proceed in the same manner for every one of the London casks above-mentioned, and all the lines will be finished when figured.

Note, The divisions for quarts, marked by dots on the rod, are made by pouring in a quart of water successively, and that you may not be at a loss to know what cask is in hand, the rod will shew you; for by measuring the depth of the bung, &c. if it cut 36, it is a barrel; if 18, it is a kilderkin, &c. and by the line for that cask you must take its ullage; that is, the quantity of liquor either drawn out, or remaining in the cask. For the uses of the line of number, &c. see GUNTER's *Line*.

GAULTHERIA, in botany, a genus of plants, whose flower cup is a double persistent perianthium, the corolla is monopetalous and ovated. The fruit is a roundish pentagonal depressed capsule, with five cells and five valves, containing a number of subovate angular osseous seeds.

GAUNTLET, or GANTLET. See the article GANTLET.

GAVOTTA, or GAVOTTE, is a kind of dance, the air of which has two brisk and lively strains in common time, each of which strains are played twice over; the first has usually four or eight bars, and the second contains eight, twelve, or more.

Tempi di GAVOTTA is when only the time or move-

movement of a gavotte is imitated, without any regard to the meaſure, or number of bars or ſtrains.

GAURA, in botany, a genus of plants, whoſe flower hath four oblong petals, with eight filiform ſtamina. The fruit is an ovate tetragonal capſule, compreſſed at the angles, and contains a ſolitary oblong angulated ſeed.

GAURS, in matters of religion, an ancient ſect of the magicians in Perſia. They have a ſuburb at Iſpahan, which is called Gaurabad, or the town of the Gaurs, where they are employed only in the meaneſt and vileſt drudgery: but they chiefly abound in Kerman, the barreneſt province in all Perſia, where the Mahometans ſuffer them to live with ſome freedom, and in the full exerciſe of their religion. Some years ago many of them fled into India, where their poſterity remain to this day.

They are a poor harmleſs ſort of people, zealous in their ſuperſtition, rigorous in their morals, and exact in their dealings: they profeſs the worſhip of one God alone, the belief of a reſurrection, and a future judgment, and utterly deteſt all idolatry; though the Mahometans believe them to be the moſt guilty of it. It is true, they perform their worſhip before fire, for which they have an extraordinary veneration, as believing it to be the moſt perfect emblem of the deity. They have the ſame veneration for Zoroaſter that the Jews have for Moſes, eſteeming him a prophet ſent from God.

GAWSE, or GAWZE, in commerce, a very ſlight, thin, open kind of ſtuff, made of ſilk, and ſometimes of thread; there are alſo figured gawzes, and ſome with gold or ſilver flowers on a ſilk ground.

GAZONS, in fortification, pieces of freſh earth, covered with graſs, and cut in form of a wedge, about a foot long and half a foot thick, to line the outſides of works made of earth, as ramparts, parapets, &c. The firſt bed of gazons is fixed with pegs of wood; the ſecond bed ſhould be ſo laid as to bind the former, by being placed over its joins; and ſo continued till the works are finiſhed. Betwixt theſe beds it is uſual to ſow all ſorts of binding herbs, in order to ſtrengthen the rampart.

GEERS, in country affairs, the trappings and other harneſs belonging to draught-horſes or oxen.

GEESE, in ornithology. See GOOSE.

GEHENNA, a term mentioned in ſeveral parts of ſcripture, which our Engliſh tranſlators have rendered hell. See HELL.

GELATINOUS, in pharmacy and medicine, any thing approaching to the glutinous conſiſtence of a gelatina, or jelly.

GELD, in our old cuſtoms, a Saxon word ſignifying money, or tribute: alſo a compenſation for ſome crime committed. See the article GILD.

GELDER-ROSE, in botany. See VIBURNUM.

GELDING, the operation of caſtrating any animal, particularly horſes.

The operation conſiſts in cutting out the teſticles: in performing which, three things are to be obſerved: firſt, regard is to be had to their age; next, to the ſeaſon of the year; and, laſtly, to the ſtate of the moon. For the firſt, if the operation is to be performed on a colt, he may be gelded at nine or at fifteen days old, if the teſticles be come down, in regard the ſooner he is gelt the better it will be for his growth, ſhape, and courage; though a horſe may be gelt at any age, if proper care be taken in the cure. As for the ſecond, the beſt time is about April or May, or elſe about the latter end of September. And for the third, the wane of the moon is the fitteſt time for performing the operation.

The manner of gelding is as follows: the beaſt being caſt down on ſome ſoft place, the operator takes the ſtones between his foremoſt and his great finger, and ſlitting the cod, preſſes the ſtones forth: then taking a pair of nippers, made very ſmooth, either of ſteel, box, or braſil-wood, he claps the ſtrings of the ſtones between them, very near to where the ſtones are ſet on, and preſſes them ſo hard, that there may be no flux of the blood; then, with a thin, drawing cauterizing iron, made red-hot, ſears away the ſtone.

This done, he takes a hard plaſter made of roſin, wax, and waſhed turpentine, well diſſoved together, and melts it on the head of the ſtrings: that being done, he ſears them, and melts more of the ſalve, till ſuch time as he has laid a good thickneſs of it upon the ſtrings.

This being done to one ſtone, the nippers are looſened, and the like is done to the other; and the two ſlips of the cod are then filled with white ſalt, and the outſide of the cod is anointed with hogs-greaſe; and thus they let him riſe, and keep him in a warm ſtable, without tying him up.

If he ſwells much in his cods or ſheath, they chaſe him up and down; and make him trot an hour in a day, and he ſoon recovers.

The manner of gelding a hog is as follows: the operator, after having made two croſs ſlips, or inciſions, on the midſt of the ſtones, preſſes them out, and anoints the ſore with tar. But another more general method, yet ſomewhat more dangerous, if not well done, is firſt to cut the ſtone on the top, and after having drawn that one forth, the operator puts in his fingers at the ſame ſlip, and, with a lancet, cuts the ſkin between the two ſtones, and by that ſlit preſſes out the other ſtone. Then having cleanſed out the blood, he anoints the part with freſh greaſe: and thus there is but one inciſion made in the cod. Boar pigs ought to be gelt about ſix months old; yet they are commonly gelded about three weeks or a month old.

GELDING *of a Lamb* may be performed from the age

age of three days to three weeks or more, in the following manner: one is to hold the lamb between his legs, or in his lap, and turn him on his back, holding his fore-feet upright together (but if any black ſpots are ſeen in his flank, he muſt not be cut at all); then the cutter holding the tip of the cod in his left hand, cuts the lap of it an inch quite away; which done, he, with the foremoſt fingers and thumbs of both hands, ſhould ſoftly ſlip down the cod over the ſtones, to the belly, and with his teeth, holding the left ſtone in his mouth, he draws it ſoftly out the length of the ſtring; after which he is to draw out the other ſtone in the ſame manner; then he ſpits in the cod, and anoints the lamb's flanks with freſh greaſe, and ſo lets him go, and keeps ſtirring him up and down for two or three hours.

GEM, *Gemma*, in natural hiſtory, a common name for all precious ſtones, of which there are two claſſes, the pellucid and ſemipellucid.

The bodies compoſing the claſs of pellucid gems are bright, elegant, and beautiful foſſils, naturally and eſſentially compound, ever found in ſmall detached maſſes, extremely hard, pellucid, and of great luſtre; compoſed of a very firm and pure matter, without any admixture of earthy ſubſtance, giving fire with ſteel, not fermenting with acid menſtruums, and very difficultly calcinable in the fire.

The bodies compoſing the claſs of ſemipellucid gems, are ſtones naturally and eſſentially compound, not inflammable no ſoluble in water, found in detached maſſes, and compoſed of cryſtalline matter debaſed by earth: however, they are but ſlightly debaſed, and are of great beauty and brightneſs, of a moderate degree of tranſparency, and are uſually found in ſmall maſſes.

Many authors, not only among the ancients but the moderns, are full of the virtues and medicinal properties of precious ſtones, but their reputation, in this reſpect, is now greatly fallen.

Imitation or counterfeiting of GEMS *in Glaſs.* The art of imitating gems in glaſs, is too conſiderable to be paſſed without notice; ſome of the leading compoſitions therein we ſhall briefly mention, upon the authority of Neri. See GLASS.

Theſe gems are made of paſtes, and are no way inferior to the native ſtones, when carefully made and well poliſhed, in brightneſs or tranſparence, but want their hardneſs. See the article PASTE.

The general rules to be obſerved in making the paſtes are theſe. 1. That all the veſſels in which they are made be firmly luted, and the lute left to dry before they are put into the fire. 2. That ſuch veſſels be choſen for the work as will bear the fire well. 3. That the powders be prepared on a porphyry ſtone, not in a metal mortar, which would communicate a tinge to them. 4. That the juſt proportion in the quantity of the ſeveral ingredients be nicely obſerved. 5. That the materials be all well mixed, and if not ſufficiently baked the firſt time, to committed to the fire again, without breaking the pot: for if this be not obſerved, they will be full of bliſters and air-bladders. 6. That a ſmall vacuity be always left at the top of the pot, to give room to the ſwelling of the ingredients.

To make paſte of extreme hardneſs, and capable of all the colours of the gems, with great luſtre and beauty.—Take of prepared cryſtal, ten pounds; ſalt of polverine, ſix pounds; ſulphur of lead, two pounds; mix all theſe well together into a fine powder; make the whole, with common water, into a hard paſte; and make this paſte into ſmall cakes of about three ounces weight each, with a hole made in their middle; dry them in the ſun, and afterwards calcine them in the ſtraighteſt part of a potter's furnace. After this, powder them, and levigate them to a perfect fineneſs on a porphyry-ſtone, and ſet this powder in pots in a glaſs furnace to purify for three days: then caſt the whole into water, and afterwards return it into the furnace, where let it ſtand fifteen days, in which time all foulneſs and bliſters will diſappear, and the paſte will greatly reſemble the natural jewels. To give this the colour of the emerald, add to it braſs thrice calcined; for a ſea-green, braſs ſimply calcined to a redneſs; for a ſapphire, add zaffer, with manganeſe; and for a topaz, manganeſe and tartar. All the gems are thus imitated in this by the ſame way of working as the making of coloured glaſſes; and this is ſo hard, that they very much approach the natural gems.

The colour of all the counterfeit gems, made of the ſeveral paſtes, may be made deeper or lighter, according to the work for which the ſtones are deſigned; and it is a neceſſary general rule, that ſmall ſtones for rings, &c. require a deeper colour, and large ones, a paler: beſides the colours made from manganeſe, verdigreaſe, and zaffer, which are the ingredients commonly uſed, there are other very fine ones which care and ſkill may prepare. Very fine red may be made from gold, and one not much inferior to that from iron; a very fine green from braſs or copper; a ſky-colour from ſilver; and a much finer one, from the granates of Bohemia.

GEMARA, in Jewiſh antiquity, a collection of deciſions and determinations on the law, wrote after the Miſchna was completed.

It was called gemera, or perfection, becauſe it was conſidered as ſo perfect an explication of the law, that after it no farther additions could be made, or any thing more deſired. It was otherwiſe called the Talmud. See TALMUD.

GEMELLUS, in anatomy, the name of two muſcles, both of which are ſmall, flat, and narrow, and ſituated almoſt tranſverſely one above the other.

4 between

between the tuberosity of the ischium and the great trochanter, immediately below the pyriformis, and parted by the tendon of the obturator internus.

The superior and smallest gemellus is fixed to the lower part of the spine of the ischium, to the superior part of the small ischiatic notch, and is continued under the acetabulum, where it is bent downwards. The inferior and largest gemellus is fixed to the superior and back part of the tuberosity of the ischium, and bending upwards towards the other line, together with it forms a sort of irregular semicircle.

GEMINATED COLUMN. See the article COLUMN.

GEMINI, or the Twins, in astronomy, is the third in order, of the twelve zodaical constellations; it is represented by two beautiful children embracing and looking each other affectionately in the face. (See Plate LVII.) The poets say they represent Castor and Pollux, sons of Jupiter and Leda, and brothers to Hellen, who, as Otway says,

—— Was the cause of a long ten year's war,
And laid, at last, old Troy in ashes.

It consists of 85 stars, as in the following catalogue, being all that have ever been observed at the Royal Observatory: they are reduced to the beginning of the year 1770.

Order	Magn.	Name.	Bayer Let.	Right Ascension.	Distance from Nor. Pole.	Var. in Right Ascen.	Var. in Declination.
				° ′ ″	° ′ ″	″	″
1	5		H	87.32. 9	66.44.43	54.8	0.9
2	8			88.10.49	66.21.28	54.4	0.8
3	8			88.55.55	66.51.56	54.2	0.6
4	7			89. 7.41	66.58.57	54.2	0.4
5	7			89.21.19	65.32.50	54.8	0.2
6	7			89.35. 6	67. 3.20	54.2	0.1
7	4		η	90.14.59	67.26.52	54.5	0.1
8	7			90.33.23	65.58.45	54.6	0.2
9	7			90.43.15	66.12.20	54.4	0.3
10	8			91.12.57	66.19.55	54.4	0.4
11	8			91.18.49	66.27.44	54.4	0.5
12	8			91.19.33	66.39.29	54.2	0.6
13	3		μ	92.15.40	67.23.21	54.5	0.7
14	7			92.57.41	68.14.39	53.6	0.8
15	7			93.30.47	69. 5.12	53.4	0.9
16	7			93.33.34	69.23.18	53.2	1.0
17	8			93.46.17	69.39.37	53.4	1.2
18	4		ν	93.49.38	69.39.48	53.6	1.3
19	7			94.34.34	73.57.25	57.6	1.4
20	.8			94.43.15	72. 4.13	52.7	1.5
21	6			94.58.12	72. 4. 1	52.2	1.6
22	7			95.15.13	70.24.44	52.8	1.7
23	5			95.40.47	72.52. 5	52.3	1.8
24	2		γ	96. 6.21	73.25.30	52.1	2.1
25	7			96.41.22	61.36.11	56.4	2.3
26	5			97.15. 6	72. 8.58	52.6	2.4
27	3		ε	97.27.39	64.39.45	55.6	2.5
28	5			97.32.38	60.49. 8	57.3	2.6
29	6			97.38.17	60.49.43	56.6	2.7
30	6			97.44.30	76.33.29	50.6	2.7
31	4	1ma ad	ξ	98. 4.48	76.52. 9	50.4	2.8
32	6	2da ad	ξ	98.14.13	77. 4.58	50.4	2.9
33	6			99. 6.33	73.33.12	51.6	3.0
34	4			99 23.29	55.46.37	59.0	3.0
35	6			99.25.48	67.59. 8	58.8	3.1
36	6		θ	99.29.52	76.20.42	58.2	3.2
37	6		d	100.17.16	64.21.19	55.2	3.3
38	6			100.23.28	76.33. 7	50.6	3.4
39	6		e	101. 9. 4	63.28.11	55.4	3.5
40	6			101.18.31	63.47.14	55.4	3.5
41	6			101.44.51	73.41.39	51.6	3.6
42	6			102. 5. 1	65.27.53	54.6	3.7
43	6	1ma ad	w	102. 5.39	65.28.40	55.1	3.7
44	4		z	102.26.54	69. 6 45	53.7	3.9
45	6.7	2da ad	w	102.51.29	67. 2. 8	53.5	3.9
46	6		o	104. 9.15	62.46.35	57.2	4.2
47	5		τ	104. 6.48	59.23.59	57.7	4.4
48	6			104.35.57	63.53. 0	54.6	4.5
49	6		m	104.36.36	65.30.25	55.1	4.6
50	6			104.46.21	74.28. 6	51.2	4.9
51	5			105. 2.19	73.28.14	51.9	5.2
52	6		n	105. 8.18	64.43.50	54.8	5.3
53	6			105.23.58	61.45.37	56.0	5.4
54	5		λ	106.13. 3	73. 3.51	52.1	5.5
55	3		δ	106.35.40	67.36.57	54.2	5.7
56	5		q	107. 5.26	69. 8.32	53.5	5.8
57	5		A	107.21.24	64.31.39	55.3	5.8
58	7			107.24.13	66.37.17	54.0	5.9
59	6		$\varkappa$	104.33.15	61.56.22	56.4	6.0
60	5		r	107.51.26	61.45.55	56.4	6.1
61	6		p	108.20.34	69.17.57	53.4	6.2
62	5			108.31. 6	68. 6.15	53.8	6.3
63	5			108.33.48	57.56.38	57.6	6.3
64	6	1ma ad	l	108.44.39	61.25.38	56.6	6.4
65	6	2da ad	b	108.52. 8	61.37.49	56.4	6.5
66	1	Castor	α	109.58.28	57.37.44	58.2	6.6
67	7			110. 3.12	73.53.18	57.4	6.7
68	6		k	110. 6.54	73.41.33	57.7	6.8
69	5		v	110.25.45	62.39.43	55.9	6.8
70	5			110.49.11	54.27. 7	59.2	6.9
71	5		o	110.59.46	54.55.56	58.8	7.0
72	6			111.16.21	61.26.48	56.0	7.1
73	6			111.23. 9	61.39.42	55.8	7.2
74	5		f	111.32.45	71.49.14	52.3	7.3
75	5		σ	112.13. 4	71.34.47	52.4	7.4
76	6		c	112.30.50	63.41.12	55.4	7.6
77	5		$\varkappa$	112.38. 7	65. 4.11	54.8	7.7

Order.	Magn.	Name.	Bayer. Let.	Right Aſcenſion.	Diſtance from Nor. Pole.	Var. in right Aſcen.	Var. in Decli-nation.
				° ′ ″	° ′ ″	″	″
78	2	Pollux	β	112.48.29	61.26.14	56.3	7.7
79	7			112.54. 5	69. 8.46	52.8	7.8
80	5		π	113. 7.51	56. 1. 7	58.2	7.8
81	6		g	113.11.58	70.56.50	52.6	7.9
82	6			113.42. 4	66.19.14	54.0	8.0
83	5		φ	114.50.50	62.39.30	55.6	8.1
84	4			114.50.47	67. 5. 4	73.6	8.2
85	6		b	115.33.16	69.30.56	52.6	8.3

GEMMA, *Gem*, in natural hiſtory. See the article GEM.

Sal GEMMÆ is the pureſt and fineſt foſſile ſalt, and an extremely fine and beautiful foſſil. It is conſiderably hard and firm, and at leaſt as pellucid as rock-cryſtal; but is frequently coloured throughout with a milky-white, which takes off greatly from its luſtre; and as cryſtal is liable to be tinged with red, green, and yellow, ſo as to reſemble rubies, ſapphires, emeralds, and topazes, ſo this ſalt is ſometimes tinged with theſe ſeveral colours; but rarely preſerves the tranſparency of cryſtal under the ſame circumſtances. See the article SALT.

GENDARMES, or GENS D'ARMES, in the French armies, a denomination given to a ſelect body of horſe, on account of their ſucceeding the ancient gendarmes, who were thus called from their being completely cloathed in armour.

The king's body guards, the light-horſe of the royal houſe, and the muſqueteers, are at preſent reputed to belong to the gendarmerie.

The grand gendarmes are a troop compoſed of about two hundred and fifty gentlemen, who guard the king's perſon. The king himſelf is their captain, and one of the prime peers their captain-lieutenant, who has under him two lieutenants, three enſigns, three guidons, and other officers. There are beſides theſe, gendarmes of the queen, the dauphin, &c.

GENDER, *Genus*, among grammarians, a diviſion of nouns, or names, to diſtinguiſh the two ſexes. See NOUN and SEX.

This was the original intenſion of gender; but, afterwards, other words, which had no proper relation either to the one ſex or the other, had genders aſſigned them, rather out of caprice than reaſon; which is at length eſtabliſhed by cuſtom. Hence genders vary according to the languages, or even according to the words introduced from one language into another. Thus, *arbor*, in Latin, is feminine; but *arbre*, in French, is maſculine: and *dens*, in Latin, is maſculine; but dent, in French, is feminine. Nay, a gender has ſometimes changed in the ſame language, according to time and occaſion. Thus, *avus*, according to Priſcian, was anciently maſculine, but afterwards became feminine; and *navire* was anciently feminine in French, but is now maſculine. In Engliſh we have no genders; indeed we expreſs the difference of ſex by different words; as boar, ſow; boy, girl, &c. We have alſo twenty-four feminines diſtinguiſhed from the males by varying the termination of the female into eſs; as actor, actreſs; prince, princeſs; heir, heireſs, &c. and we have a few words in which the feminine is diſtinguiſhed from the maſculines by the termination ix, as executor, executrix; adminiſtrator, adminiſtratrix, &c. which is all our language knows of any thing like genders.

The eaſtern languages, as well as the vulgar languages of the weſt, have only two genders, the maſculine and the feminine. The Greek and Latin have beſides, the neuter, common, and doubtful genders. This laſt indeed is not common, for it properly belongs only to the names of ſome animals, which are promiſcuouſly joined both to maſculine and feminine adjectives, to expreſs their male or female, as *bos*, *canis*, *ſus*, &c. They have alſo the epicœne gender, which is not a different one, but ſerves promiſcuouſly for either; including both the kinds under one ſingle gender and termination: thus *vulpes*, a fox, though it ſignifies either the male or female, is really of the feminine gender, in Latin. And ſo *cuſtodiæ*, watchmen or centinels, are really feminine, though they ſignify men. This is common to all languages that have them. The Latin and Greek, in the neuter gender, do not regard them, having no relation to the male or female ſex, but what fancy gives them, and the termination of certain words.

The Oriental languages frequently neglect the uſe of genders; and the Perſian language has none at all, which is no diſadvantage: the diſtinction of genders being entirely uſeleſs.

GENEALOGY, γενεαλογια, an enumeration of a ſeries of anceſtors; or a ſummary account of the relations and alliances of a perſon or family, both in the direct and collateral line.

GENERAL TERMS, among logicians, thoſe which are made the ſigns of general ideas.

All things that exiſt, Mr. Locke obſerves, being particulars, it might be expected that words ſhould be ſo too in their ſignification: but we find it quite contrary; for moſt of the words that make all languages are general terms. This is the effect of reaſon and neceſſity. For,

Firſt, it is impoſſible that every particular thing ſhould have a diſtinct name, becauſe it is impoſſible to have diſtinct ideas of every particular thing, to retain its name, with its peculiar appropriation to that idea.

Secondly, It would be uſeleſs, unleſs it could be ſuppoſed to have theſe ſame ideas in their minds: for names applied to particular things, whereof I alone have the ideas in my mind, could not be ſignificant

or intelligible to another, who is not acquainted with all thoſe particular things which have fallen under my notice.

Thirdly, It would be of no great uſe for the improvement of knowledge; which, though founded in particular things, enlarges itſelf by general views; to which things, reduced into ſorts under general names, are properly ſubſervient.

In things where we have occaſion to conſider and diſcourſe of individuals and particulars, we uſe proper names: as in perſons, countries, cities, rivers, mountains, &c. Thus we ſee that jockeys have particular names for their horſes, becauſe they often have occaſion to mention this or that particular horſe, when he is out of ſight.

Afterwards, obſerving that a great many things reſemble each other in ſhape, and other qualities, we frame a general idea that takes in only the qualities in which thoſe many particulars agree; and to this idea we give the name *man*, for example, in which there is nothing new; that which is peculiar to each individual being left out, and only what is common to all retained. And thus we come to have a general idea, and a general name. By the ſame method the mind proceeds to more general notions and names, as thoſe of animal, ſubſtance, being, thing, and ſuch univerſal terms as ſtand for any ideas whatſoever.

As to the ſignification of general words, it is evident they do not barely ſignify one particular thing; neither do they ſignify a plurality. But they ſignify a genus, kind, or ſort of things. See the articles ABSTRACTION and GENUS.

GENERAL *of an Army*, in the art of war, he who commands in chief. See ARMY.

A general ought to be a man of great courage and conduct, to have great experience, and to be of good quality. His conduct appears in eſtabliſhing his magazines in convenient places; in examining the country, that he may not engage his troops too far, while he is ignorant of the means of bringing them off; in ſubſiſting them; and in knowing how to take the moſt advantageous poſts, either for fighting or ſhunning a battle. His experience inſpires his army with confidence, and an aſſurance of victory; and his quality, by creating reſpect, augments his authority. By his liberality he gets intelligence of the ſtrength and deſigns of the enemy, and by this means is enabled to take the moſt ſucceſsful meaſures. A general ought likewiſe to be fond of glory, to have an averſion to flattery, to render himſelf beloved, and to keep a ſtrict diſcipline.

The office of a general is to regulate the march and encampment of the army; in the day of battle to chuſe out the moſt advantageous ground; to make the diſpoſition of the army; to poſt the artillery; and where there is occaſion, to ſend his orders by his aids de camp, At a ſiege he is to cauſe the place to be inveſted; to order the approaches and attacks; to viſit the works; and to ſend out detachments to ſecure his convoys.

GENERAL is alſo uſed for a particular march, or beat of drum; being the firſt which gives notice, commonly in the morning early, for the infantry to be in readineſs to march.

GENERATING *Line*, or *Figure*, in geometry, is that which by its motion produces any other plane or ſolid figure. Thus, a right line moved any way parallel to itſelf, generates a parallelogram; round a point in the ſame plane, with one end faſtened in that point, it generates a circle. One entire revolution of a circle, in the ſame plane, generates the cycloid; and the revolution of a ſemi-circle round its diameter, generates a ſphere, &c. See the articles CYCLOID, SPHERE, &c.

GENERATION, *Generatio*, in phyſiology, the act of procreating and producing a thing which before was not; or, according to the ſchoolmen, it is the total change or converſion of one body into a new one, which retains no marks of its former ſtate. Thus, we ſay, fire is generated, when we perceive it to be where before there was only wood, or other fuel: in the ſame manner a chick is ſaid to be generated, when we perceive it where before there was only an egg; or the egg is changed into the form of a chick.

In generation, there is not properly any production of new parts; but only a new modification, or manner of exiſtence, of the old ones.

When almighty God, ſays Dr. Blair, created the world, he ſo ordered and diſpoſed of the *materies mundi*, that every thing produced from it ſhould continue ſo long as the world ſhould ſtand. Not that the ſame individual ſpecies ſhould always remain; for they were in proceſs of time to periſh, decay, and return to the earth from whence they came; but that every like ſhould produce its like, every ſpecies produce its own kind, to prevent a final deſtruction of the ſpecies, or the neceſſity of a new creation. For which end, he laid down certain regulations, by which each ſpecies was to be propagated, preſerved, and ſupported, till, in order and courſe of time, they were to be removed hence: for without that, thoſe very beings, which were created at firſt, muſt have continued to a final diſſolution of all things; which almighty God of his infinine wiſdom, did not think fit. But that he might ſtill the more manifeſt his omnipotence, he ſet all the engines of his providence to work, by which one effect was to produce another, by means of certain laws or rules, laid down for the propagation, maintenance, and ſupport of all created beings. This his divine providence is called nature, and theſe regulations are called the laws or rules of nature, by which it ever operates in its ordinary courſe; and whatever recedes from that, is ſaid to be preternatural, miraculous, or monſtrous.

GENERATION *of Animals.*—According to Ariſtotle, the males contain the principle, and the females the matter of generation: for though both were furniſhed, indeed, with a ſeminal liquor, yet the ſemen of the males alone was prolific. The moderns, on the other hand, as well thoſe who contend for the ſyſtem of generation from eggs, as they who adopt that of the animalcules in the male ſeed, pretend that females have no ſuch ſeminal liquor at all, and that what was commonly taken for it was ſome other animal fluid.

There are great and many difficulties which attend the moſt plauſible account of the firſt formation of the parts of an animal, and the beginning of motion in its fluids: for though both reaſon and experience convince us, that all the parts of an animal did exiſt before generation, yet, how this matter comes to aſſume ſo very different a form, as that of an embryo, is by no means agreed on.

Harvey is of opinion, that all females are furniſhed with eggs, and that the embryoes, or young animals, are formed in the ſame manner as a chick in the egg of any bird. Generation, according to this celebrated phyſician, is effected only by means of the uterus, or womb, which conceives the fœtus by a kind of contagion communicated to it by the male ſeed, much in the ſame way as a load-ſtone communicates magnetiſm to iron. This contagion, he thinks, acts not only on the uterus, but is communicated to the whole body of the female, which is altogether prolific; though the uterus he acknowledges is the only part that is capable of conceiving the fœtus, juſt as the brain is alone capable of forming ideas and notions. Agreeably to this doctrine of Harvey, Steno, and other anatomiſts, have pretended to diſcover certain eggs in the ovaries or teſticles of women; which Mr. Buffon denies to be the caſe, affirming, that there are no ſuch eggs to be found in the teſticles or ovaries of women.

We cannot enter into a detail of the reaſonings for and againſt the ſyſtem of generation from eggs, and ſhall therefore only obſerve, that its advocates pretend to have diſcovered eggs in all the females on which they made obſervations; that the largeſt of thoſe found in women did not exceed the bigneſs of a pea; that they are extremely ſmall in young girls under fourteen, but that age and commerce with men makes them grow larger; that there are more than twenty ſuch eggs in each ovary or teſticle; that they are fecundated in the ovary by the ſpirituous and volatile part of the male-ſeed; that they afterwards are detached and fall into the uterus through the Fallopian tubes; that here the fœtus is formed of the internal ſubſtance of the egg, and the placenta of the exterior part. See the article FOETUS.

Leewenhoek is the author of another ſyſtem of generation, from animacules in the male ſeed. He tells us, he diſcovered many thouſands of theſe in a drop leſs than a grain of ſand. Theſe are found in the ſemen of all males whatever, but not in that of females; and are ſo ſmall, that 3,000,000,000 of them are not equal to a grain of ſand, whoſe diameter is but the hundredth part of an inch. When any of theſe animalcules gets into an egg, fit to receive it, and this falls into the womb through the Fallopian tubes, the humous which diſtil through the veſſels of the womb, penetrating the coats of the egg, ſwell and dilate it, as the ſap of the earth does ſeed thrown into it. The placenta begins to appear like a little cloud, upon one ſide of the external coat of the egg; and, at the ſame time, the ſpine of the embryo-animalcule is grown ſo big, as to become viſible; and a little afterwards, the cerebrum and cerebellum appear like two bladders; and the eyes ſtand next goggling out of the head; then the beating of the heart, or punctum ſaliens, is plainly to be ſeen; and the extremities diſcover themſelves faſt of all.

The animalcules are of different figures, ſome like tadpoles, and others like eels. In the ſemen of a man, and in that of a dog, there have been diſcovered two different kinds of them, the one ſuppoſed to be males, and the other females. Some even pretend to have ſeen animalcules diſengage themſelves from the membranes that ſurround them; and that they then appeared perfectly like men, with legs, arms, &c. like thoſe of the human body.

All the advocates for the ſyſtem of generation from animalcules ſtrongly oppoſe that from eggs. They contend, that theſe animalcules cannot be looked upon as the inhabitants of the ſemen, ſince they were of greater extent than the liquor itſelf, not to mention that no ſuch animals are found in any other liquors of the body; and ſince females have nothing ſimilar to theſe animals, they think it manifeſt that the prolific principle reſides in the males. When they are aſked, to what purpoſe ſerves ſuch an immenſe profuſion of human animalcules, they anſwer, that it is agreeable to the ordinary courſe of nature, both in the animal and vegetable part of the creation. They likewiſe ſtrengthen their ſyſtem, by alledging the many examples we have of ſimilar transformations in the inſect-claſs of animals, which from caterpillars and ſmall worms, become winged animals of the butterfly, or fly-kinds.

By this ſyſtem, ſays Mr. Buffon, the firſt woman cannot be ſaid to have contained the whole race of mankind, as being all, according to it, the true poſterity of the firſt man, and in their animalcule-ſtate contained only in him. On this principle he proceeds to invalidate the ſyſtem of generation from animalcules: for ſuppoſing the ſize of a man to be 1, then will that of one of the ſpermatic animalcules be $\frac{1}{1000000000}$; and as a man is to an

animalcule of the first generation in the same ratio, that this animalcule is to an animalcule of the second generation, it follows that this will be expressed by the fraction $\frac{1}{100000000000000000}$. In this manner he computes the size of the animalcules of several generations, all supposed to be living animals, notwithstanding that their minuteness exceeds the power of imagination to conceive; and then tells us, that the system of generation from eggs is liable to the same objections, whereof the detail may be seen in his *Hist. Natur. tom. 2. p. 157, & seq.*

As to Buffon's own system, he thinks that every part, both of animals and vegetables, contains an infinite number of organic molecules; that these molecules assume successively different forms, and are put into different motions, according to the circumstances they are in; but that they are much more numerous in the seminal liquors of both sexes, and the seeds of plants, than in other parts; that these organic molecules make the matter of nutrition; that this matter is always active, and tends to organization, forming itself into different shapes, according to the moulds it meets with. When the quantity of this organic matter is but small, as in man, and most large animals, generation only takes place at the age of maturity, and even then the number of animals produced is but small. The case is just the reverse in animals which abound with this matter, as in fishes, and most birds.

With respect to the generation of mankind, the same author thinks it a certain fact, that the male-seed is received into the womb of the woman; and that, for this purpose, it is highly probable the internal orifice opens during the act of coition. The female-seed also makes its way into the womb, where being mixed with that of the male, they both together contribute to the formation of the fœtus; which is either male or female, according as the seed of the man or woman abounds most with organic molecules; and the infant resembles either the father or mother, according to the different combinations of these molecules. Both these seminal liquors he thinks equally active in the formation of the fœtus, and that they fix and counterballance each other; the molecules of each parent being thereby determined to form similar parts to those of the individual that furnished them, as the head, trunk, arms, legs, &c. He thinks the molecules proceeding from the genital parts fix themselves first; and that the other molecules arrange themselves successively round these, in the same order which they before occupied in the parent. When a great quantity of the seminal liquors of both sexes is received into the womb, there are formed different spheres of attraction in different parts of these liquors; the consequence of which is, that several fœtuses are formed at the same time. See VEGETATION.

Nearly a-kin to Mr. Buffon's system is that of Mr. Maupertuis, which he has explained in his *Venus Physique*. He observes, that all the variety, observable among mankind, may have been accidental at first; but being once established in the constitution of the parents, they become natural to their posterity. To illustrate this, he gives an instance of a sexdigitary family at Berlin, who had six fingers, or six toes, and frequently both; and that this peculiarity was transmitted equally by the father and mother, but was lost by alliances with those who had but the usual number of fingers or toes.

He farther observes, that most animals, excepting mankind, have stated seasons for procreation, and that the females go with young some a longer, others a shorter time. Mares go from eleven to twelve months; cows and hinds go nine months; and bitches go only seven weeks; cats nine weeks; and rabbits but thirty-one days. Most birds are hatched in twenty-one days; the canary birds, and some others, are hatched in thirteen or fourteen days. It appears, therefore, that there is an endless variety in the time and manner of the generation of animals.

Those who desire a more full account of these systems of generation may consult Harvey, Leewenhoek, Buffon, &c.

Parts of GENERATION. The parts of generation, in men, are the testicles, vasa deferentia, vesiculæ seminales, and penis. See the article TESTICLE, &c.

Those, in women, are the pudendum or vulva, the clitoris, nymphæ, vagina, uterus or womb, ovaries, and Falopian tubes. See the articles PUDENDUM, CLITORIS, &c.

GENERATION *of Fishes*. The opinion of most naturalists, that the female fishes first deposit their spawn, and that the males afterwards eject the semen upon it, is denied by Linnæus; who thinks it impossible that the eggs of any animal should be impregnated out of its body. He thinks it much more probable, that the males always eject their semen some time before the females deposit their spawn; and that, by swallowing this semen, the spawn is impregnated in the body of the fish. Nay, he tells us, that he himself saw three or four females, in the spawning time, gather about the male, and greedily swallow the semen he ejected. This he observed in some species of the esox, pearch, and especially the cyprinus; but he recommends farther enquiry to be made on this subject.

GENERATION *of Insects* is now certainly known to be from eggs; which the female deposits in places, where, at a proper season, they are hatched into animals like their parents; or into maggots, or worms, which, after several transformations, at last appear in the form of their parents.

GENERATION *of Plants*. The impregnation of the female palm-tree by the male, has been known in the most ancient times. Herodotus, the father of

GNOMON, in dialling, is the ſtyle or pin of a dial, whoſe ſhadow ſerves to point out the hour.

The word is Greek, and derived from γνωμων, which imports ſomewhat that makes known; becauſe the ſtyle indicates the hour.

The gnomon of every dial is ſuppoſed to repreſent the axis of the world, and therefore the two ends, or extremities thereof, muſt anſwer to the north and ſouth poles.

GNOMON, in geometry. If a parallelogram be divided into four leſſer ones by two right lines drawn reſpectively parallel to the ſides thereof, and one of theſe parallelograms be retrenched, or taken away; the remaining three will form a gnomon.

GNOMON, in aſtronomy, a pillar, &c. erected to find meridian altitudes of the ſun and ſtars by its ſhadow.

The method of finding the ſun's meridian altitude by the help of a gnomon was much uſed by the ancients. It muſt be obſerved, that the greater the height of the ſun is, the ſhorter is the ſhadow of a gnomon, and the contrary. In making obſervations for determining the meridian altitudes of the ſun and ſtars, it was uſual to ſet down what proportion the length of the ſhadow bore to the height of the pillar; that is, the heighth of the pillar being divided into a certain number of equal parts, to ſay how many of theſe parts the length of the ſhadow amounted to at the equinoxes or ſolſtices. The moſt ancient obſervation of this kind, that we meet with, is that made by Pytheas, in the time of Alexander the Great, at Marſeilles, where he found the height of the gnomon was to the meridian ſhadow, at the ſummer ſolſtice, as $213\frac{1}{3}$ to 600; the ſame as Gaſſendus found it to be, by an obſervation made at the ſame place, almoſt 2000 years after, in the year 1636.

A very exact method whereby to obſerve the meridian altitude of the ſun is as follows.—Make a circular perforation in a braſs plate, to tranſmit enough of the ſun's rays to exhibit his image on the floor: fix this plate parallel to the horizon in a high place proper for obſervation: then let fall a plumb-line, whereby to meaſure the height of the perforation above the floor. Take care the floor be perfectly level, and exactly horizontal; and let it be whitened over, to exhibit the ſun more diſtinctly: draw a meridian line thereon, paſſing through the foot of the gnomon, that is, through the point where the center of the plumb-line marks the floor: note the extreme points of the ſun's diameter on the meridian line K and I (Plate LX. *fig.* 5.) and from each ſubtract a right-line equal to the ſemi-diameter of the aperture, viz. K H on one ſide, and L I on the other: then will H L be the image of the ſun's diameter, which, biſected in B, gives the point on which the rays fall from the center of the ſun.

Now having given the right-line A B, and the altitude of the gnomon, with the angle A, which is right; the angle A B G, or the apparent altitude of the ſun's center, is eaſily found: for aſſuming one of the given ſides A B for radius; A G will be the tangent of the oppoſite angle B. Then ſay, as one leg A B: is to the other A G:: ſo is the whole ſine: to the tangent of the angle B.

GNOMONICS, *Gnomonica*, the art of dialling, or of drawing ſun and moon dials, on any given plane. See the article DIAL.

GNOSTICS, in church-hiſtory, chriſtian heretics ſo called, it being a name which almoſt all the ancient heretics affected to take, to expreſs that new knowledge and extraordinary light to which they made pretenſions; the word gnoſtic ſignifying a learned, or enlightened perſon.

St. Epiphanius aſcribes the origin of the Gnoſtics to Simon Magus, and ſays that they acknowledged two principles, a good and a bad. They ſuppoſed there were eight different heavens, each of which was governed by its particular prince: the prince of the ſeventh heaven, whom they named Sabaoth, created the heavens and the earth, and ſix heavens below him, and a great number of angels. In the eighth heaven they placed their Barbelo, or Barbero, whom they ſometimes called the father and ſometimes the mother of the univerſe. All the Gnoſtics diſtinguiſhed the creator of the univerſe from God, who made himſelf known to men by his Son, whom they acknowledged to be the Chriſt. They denied that the Word was made fleſh; and aſſerted that Jeſus Chriſt was not born of the Virgin Mary, that he had a body only in appearance, and that he did not ſuffer in reality. They neither believed a reſurrection, nor a judgment to come; but imagined that thoſe who had not been inſtructed in their maxims, would return into the world, and paſs into bodies of hogs and other of the like animals. They had ſeveral apocryphal books, as the Goſpel of St. Philip, the Revelations of Adam, the Goſpel of Perfection, &c.

GOAT, *Capra*, in zoology, a quadruped of the order of the pecora. See the article CAPRA.

GOAT's-BEARD, *Tragopogon*, in botany. See the article TRAGOPOGON.

GOAT's-EYE, *Ægias*, among ancient phyſicians. See ÆGIAS.

GOAT-SUCKER, *Caprimulgus*, in ornithology, a ſpecies of hirundo. See HIRUNDO.

GOAT's-THORN, the ſame with tragacanth.

GOBELINS, a celebrated manufactury for tapeſtry, eſtabliſhed by Mr. Colbert, at Paris, in 1667. See TAPESTRY.

GOBONE, or GOBONY, in heraldry, the ſame with componed. See COMPONED.

GOD, *Deus*, the Supreme Being, the firſt cauſe or creator of the univerſe, and the only true object of religious worſhip.

The Hebrews called him Jehovah; which name they never pronounced, but uſed inſtead of it the words Adonai, or Elohim.

God, ſays Sir Iſaac Newton, is a relative term, and has reſpect to ſervants. It denotes, indeed, an eternal, infinite, abſolutely perfect being: but ſuch a being without dominion, would not be God. The word God frequently ſignifies lord, but every lord is not God. The dominion of a ſpiritual being, or lord, conſtitutes God; true dominion, true God; the ſupreme, ſupreme; pretended, pretended. From ſuch true dominion it follows that the true God is living, intelligent, and powerful; and from his other perfections, that he is ſupreme, or ſupremely perfect. He is eternal and infinite, omnipotent and omniſcient; that is, he endures from eternity to eternity, and is preſent from infinity to infinity. He governs all things that exiſt, and knows all things that are to be known. He is not eternity or infinity, but eternal and infinite. He is not duration and ſpace, but he endures and is preſent: he endures always, and is preſent every where; and by exiſting always and every where, conſtitutes the very things we call duration and ſpace, eternity and infinity. He is omnipreſent, not only virtually, but ſubſtantially; for power without ſubſtance cannot ſubſiſt. All things are contained and move in him, but without any mutual paſſion, that is, he ſuffers nothing from the motions of bodies, nor do they undergo any reſiſtance from his omnipreſence.

With reſpect to Chriſtians it will be ſufficient to mention, that they were very early divided in opinion, with regard to the nature and eſſence of the Supreme Being; a great part worſhipping three perſons in the unity of the godhead, while others abſolutely rejected a trinity of perſons, and aſſerted the unity of the Divine nature, both with reſpect to perſon and ſubſtance.

GODDESS, a heathen deity of the female ſex.

GOD-FATHERS and GOD-MOTHERS, perſons who undertake to anſwer for the future conduct of infants at their baptiſm.

GOLD, *Aurum*, the ſol and rex metallorum of the chemiſts, is a yellow metal ſcarce at all elaſtic or ſonorous, very ſoft and flexible, the moſt ductile of all metallic bodies. Dr. Halley took one grain of gilt ſilver, of which only one forty-eighth part was gold: this grain was drawn into a wire two ells in length, which examined by a microſcope, appeared every where covered with the gold: a piece of the wire being put into aqua-fortis, the ſilver was eaten out, and a tube of gold remained, which notwithſtanding its extreme thinneſs, was ſtill opake.

Gold is of all natural bodies the moſt ponderous: hence it ſinks into quickſilver, whilſt all other ſubſtances, platina excepted, ſwim on the ſurface. It is upwards of nineteen times heavier than an equal bulk of water: a Paris cubic foot is reckoned to weigh 1368 pounds. From its greater denſity it becomes ſenſibly hotter than other bodies when laid with them in hot water.

Gold diſſolves in a mixture of the nitrous and marine acids, called, from its action on this rex metallorum, aqua-regia: either of theſe acids ſingly have no effect upon it; nor is it acted on by the vitriolic.

GOLD-WIRE, a cylindrical ingot of ſilver, ſuperficially gilt, or covered with gold at the fire, and afterwards drawn ſucceſſively through a great number of little, round holes, of a wire-drawing iron, each leſs than the other, till it be ſometimes no bigger than a hair of the head. See the article WIRE.

GOLD-WIRE *flatted*, is the former wire flatted between two rollers of poliſhed ſteel, to fit it to be ſpun on a ſtick, or to be uſed flat, as it is without ſpinning, in certain ſtuffs, laces, embroideries, &c. See the article STUFF, &c.

GOLD-THREAD, or SPUN GOLD, is a flatted gold, wrapped or laid over a thread of ſilk, by twiſting it with a wheel and iron bobins.

GOLD-LEAF, or BEATEN GOLD, is gold beaten with a hammer into exceeeing thin leaves, ſo that it is computed, that an ounce may be beaten into ſixteen hundred leaves, each three inches ſquare, in which ſtate it takes up more than 159052 times its former ſurface.

This gold they beat on a block of black marble, about a foot ſquare, and uſually raiſed three feet high: they make uſe of three ſorts of hammers, formed like mallets, of poliſhed iron: the firſt, which weighs three or four pounds, ſerves to chaſe, or drive: the ſecond, of eleven or twelve pounds, to cloſe; and the third, which weighs fourteen or fifteen pounds, to ſtretch and finiſh. They alſo make uſe of four moulds of different ſizes, viz. two of vellom, the ſmalleſt whereof conſiſts of forty or fifty leaves, and the larger of two hundred: the other two, conſiſting each of five hundred leaves, are made of bullocks guts well ſcoured, and prepared.

Method of preparing and beating GOLD. They firſt melt a quantity of pure gold, and form it into an ingot: this they reduce, by forging, into a plate about the thickneſs of a ſheet of paper; which done, they cut the plate into little pieces about an inch ſquare, and lay them in the firſt or ſmalleſt mould to begin to ſtretch them: after they have been hammered here a while with the ſmalleſt hammer, they cut each of them into four, and put them into the ſecond mould, to be extended farther.

Upon taking them thence, they cut them again into four, and put them into the third mould, out of which they are taken, divided into four, as before, and laid in the laſt, or finiſhing mould, where they are beaten to the degree of thinneſs required.

The

The leaves thus finiſhed, they take them out of the mould, and diſpoſe them into little paper books, prepared with a little red bole for the gold to ſtick to; each of which ordinarily contains twenty-five gold leaves. There are two ſizes of theſe books; twenty-five leaves of the ſmalleſt only weigh five or ſix grains, and the ſame number of the largeſt, nine or ten grains.

It muſt be obſerved, that gold is beaten more or leſs, according to the kind or quality of the work it is intended for; that for the gold wire-drawers to gild their ingots, is left much thicker than that for gilding the frames of pictures, &c. withal. See GILDING.

GOLD-FINCH, in ornithology, the Engliſh name of a ſpecies of fringilla, with the wings variegated with black, yellow, and white.

GOLD-SIZE. See the article SIZE.

GOLD-SMITH, or as ſome chooſe to expreſs it, ſilver-ſmith, an artiſt who makes veſſels, utenſils, and ornaments in gold and ſilver.

Shell-GOLD, that uſed by the illuminers, and wherewithal we write gold letters. It is made of made of the pareings of leaf-gold, and even of the leaves themſelves, reduced into an impalpable powder, by grinding on a marble with honey. After leaving it to infuſe ſome time in aqua-fortis, they put it in ſhells, where it ſticks. To uſe it they dilute it with gum-water, or ſoap-water.

GOLDEN, ſomething that has relation to gold, or conſiſts of gold, is valuable, or the like; as,

GOLDEN-BULL. See the article BULL.

GOLDEN-CALF, in Jewiſh antiquity, a figure which the Iſraelites caſt in gold, and ſet up in the wilderneſs to worſhip during Moſes's abſence in the mount, and which that legiſlator, at his return, burnt, ground to powder, and mixed with the water the people were to drink of; as in Exod. xxxii.

GOLDEN-FLEECE, in the ancient mythology, the ſkin, or fleece, of the ram upon which Phryxus and Hella are ſuppoſed to have ſwam over the ſea to Colchis; which being ſacrificed to Jupiter, its fleece was hung upon a tree in the grove of Mars, guarded by two brazen-hoofed bulls, and a monſtrous dragon that never ſlept; but was at laſt taken and carried away by Jaſon, and the Argonauts.

GOLDEN-NUMBER, in chronology, a number ſhewing what year of the moon's cycle any given year is. See CYCLE *of the Moon*.

GOLDEN-RULE, in arithmetic, is alſo called the rule of three, and the rule of proportion. See PROPORTION and RULE OF THREE.

GOLDEN-ROD, in botany. See the article SOLIDAGO.

GOLDEN-SAXIFRAGE. See the article CHRYSOPLENIUM.

GOLPS, in heraldry, are roundles of a purple tincture, called by the French *torteaux*, adding their peculiar colours.

GOMPHOSIS, γομφωσις, in anatomy, a ſpecies of articulation, wherein one bone is ſet in the other, like a nail or peg; as the teeth within the jaws.

GOMPHRENA, the purple everlaſting flower, in botany, a genus of plants, the flower of which is divided into five parts, and erect; the petals are ſubulated and permanent: the fruit is a thin, roundiſh cruſt, with one cell, in which are contained a ſingle, large, roundiſh ſeed, with an oblique end. It is a native of both Eaſt and Weſt-Indies; and the flower is uſually of a beautiful purple colour.

GONDOLA, a ſort of barge curiouſly ornamented, and navigated on the canals of Venice. See the article BARGE.

GONORRHOEA, in medicine, an involuntary efflux of the ſeminal juices, and ſome other recrementitious matter.

A virulent gonorrhœa, or clap, proceeds from impure coition with an infected perſon.

This diſtemper begins, and makes its progreſs, in the following manner.

The patient, ſooner or later, according as the perſon with whom he has had converſation, was more or leſs infected, and according to his conſtitution, by which he may be more or leſs diſpoſed to receive the infection, is firſt ſeized with an unuſual pain in the genetals; and a kind of ſenſation like a rotation of his teſticles. Afterwards, if the prepuce conſtantly covers his glands, there appears an eruption, or puſtule, which, by its ſize, colour, and figure, reſembles a ſpot of the meaſles. Preſently after appears a weeping matter like ſemen, which daily changes colour, and becomes more purulent, and more yellow, till at length, if the diſorder be highly virulent, it aſſumes a greeniſh hue, or appears like a thin ſanious matter, mixed with blood. The puſtule at length becomes an ulcer, called a ſhanker.

Thoſe whoſe glans is uncovered, ſeldom have ſuch a puſtule, and are leſs liable to imbibe the infection. The running brings on a heat, or ſmarting in making water, which is moſt violent when it is over, for then it ſeems to burn the whole duct of the urethra.

Another ſymptom is the cordee, or contraction of the frænum, by which the penis is bent downwards. There is likewiſe, when the penis is erected, great pain, as if compreſſed tranſverſely with a ſtrong hand. This chiefly happens in the night, when the patient is warm in bed: ſometimes the urethra being eaten, and excoriated with long running of acrimonious pus, nature breeds a ſoft ſpungy fleſh, to ſupply the defect; which daily increaſing, forms caruncles, or carnoſities ſo far as to plug up the urinary paſſage, and ſtop up the urine. However, the little adjoining ulcers continue to pour forth a kind of an ichor. It alſo happens, through ſome violent motion, or the ill-timed uſe of aſtrin-

aſtringents, that the ſanies, which ſhould be carried off by the gonorrhœa, is tranſlated to the ſcrotum, and cauſes one or both of the teſticles to ſwell, and inflame with intolerable pain: the running at the ſame time decreaſing, while the ſcalding of the urine is as great as ever.

To theſe ſymptoms may be added the phimoſis, and the paraphimoſis. There are alſo ſometimes watery bladders, called cryſtallines, and at length buboes of the glans in the groin. See PHIMOSIS, PARAPHIMOSIS, BUBO, and POX.

Women are not ſubject to ſuch a variety of ſymptoms as men; their chief complaint being a difficulty of urine, and a running; however, they are liable to ſhankers and venereal warts, as well within as on the outward parts of the labia pudendi; as alſo to buboes in the groin: as for the coarctation of the ſphincter vaginæ, purſing as it were the external orifice, this is not a phimoſis, though by ſome improperly ſo called.

This diſorder proceeding from an infection of a malignant gonorrhœa, or the lues venerea, is firſt conveyed to the genitals, and afterwards through the pores to the lymph, or ſeminal liquor; the due craſis and natural mixture of which it deſtroys, by inducing partly a cauſtic and corroding, and partly a putrid ſtate thereof; hence ariſe the pains, the heats, the tumours, the inflammations, and the exulcerations of the genitals: for at firſt the glans only is infected whilſt in coition, the poiſon inſinuating itſelf into the pores; after which, it ſoon proceeds to the glans of the urethra, then to the proſtatæ, and afterwards to the veſiculæ ſeminales.

Aſtruc, in the cure of this diſorder, directs the uſe of crude quickſilver, as in the common unction, to be rubbed upon the parts, as about the penis, eſpecially under the urethra, to the perinæum, and ſo up to the pubes and teſticles, by which the mercury, inſinuating itſelf through the pores into the lymphatic veſſels, is inſtantly conveyed into the glandules, and ſubdues the poiſon lodged therein, taking away all the ſymptoms without any diſturbance to the primæ viæ, the ſtomach and guts.

If there is no diſcharge from the penis of any virulent matter, it is called the gonorrhœa ſicca, or dry clap; the ſymptoms of which are a dyſury, or difficulty of making water, and after, from the increaſe of the inflammation and tumefaction, an iſchury, or total ſuppreſſion of urine.

In the cure of the dry clap, Aſtruc adviſes plentiful bleeding in the beginning, to take off the tenſion, and to abate the inflammation; as alſo emollient decoctions of mallows, linſeed, &c. in milk, to foment the parts: but perhaps it might be better to make a poultice of theſe ingredients, after Boerhaave's method, to lay to the parts affected; or, which is beſt of all, to uſe them one after the other.

Aſtruc adviſes alſo lenient clyſters, cooling emulſions, and ptiſans, with ſal prunella and anodynes, between whiles. During the continuance of the inflammation, no mercurials muſt be uſed, and if the ſymptoms increaſe, threatening an abſceſs in the perinæum, it is to be forwarded as much as poſſible, by ſuppurative poultices, and the matter diſcharged.

When the gonorrhœa has continued a long while, or long enough for the poiſonous matter to make its way into the blood; or by aſtringents given unſeaſonably it cannot make its exit; then the patient is infected with the pox.

The third ſpecies of this diſorder requires the very ſame treatment with the ſimple and virulent: but here the leaſt time muſt not be loſt; the affected part muſt be kept in a conſtant ſtate of laxity, by the moſt emollient applications; and the contageous matter muſt with all poſſible expedition be drawn out: for the whole cure depends upon the total diſcharge of the infectious matter, together with the pus, which it has introduced; and if this taſk is not performed, a pox is greatly to be apprehended. Wherefore, if this diſeaſe continues but for a little time, recourſe muſt be had to all the ſeverities of ſalivation. For though ſalivating does not at all cure either of the two former kinds of gonorrhœa, this ſpecies of the diſeaſe, having its ſeat in the glandulæ Cowperianæ of the urethra, ſo that the pus diſcharges itſelf by their excretory duct into the urinary duct, is much more ſuſceptible of the power of mercury.

GOOD, in general, whatever is apt to cauſe or increaſe pleaſure, or diminiſh pain in us; or, which amounts to the ſame, whatever is able to procure, or preſerve to us the poſſeſſion of agreeable ſenſations, and remove thoſe of an oppoſite nature.

Metaphyſical GOOD, the ſame with perfection. See PERFECTION.

Moral GOOD, denotes the right conduct of the ſeveral ſenſes and paſſions, or their juſt proportion and accommodation to their reſpective objects and relations.

GOOD BEHAVIOUR, in law, an exact carriage and behaviour to the king and his people.

GOOGINGS, in ſhip-building, certain plates of iron bolted to the ſtern-poſt of a ſhip, to receive and keep ſteady the rudder.

There are four or five of them on the ſtern-poſt, having a large hole in each, into which certain ſpindles, called pintles, are introduced, upon which the rudder reſts, and turns as upon an axis. See the article RUDDER.

GOOSE, *Anſer*, in ornithology, a well-known bird of the anas-kind, with the back of a greyiſh brown colour, the belly and edges of the wing-feathers white.

GOOSEBERRY, *Groſſularia*, in botany, a genus of plants of the ſhrub kind; its characters are,

it hath a woody root, the branches when full grown are of a dark purple colour, armed with ſharp thorns at the riſe of the leaves, which have ſhort pedicles, and are lacinated like thoſe of the currant or vine, but leſs; the flowers are like thoſe of the currant, with which Linnæus claſſes them, under the general names ribes, but as they differ much both in their appearance and alſo their fruit, which in this grow not in bunches, it may here be thought proper to ſeparate them as diſtinct genera. There are ſeveral ſorts of gooſeberries propagated in gardens, as the amber-gooſeberry, red hairy gooſeberry, large Dutch gooſeberry, green gooſeberry, red ſmooth gooſeberry, with ſome other varieties; they are all propagated by cuttings, ſuckers, or from ſeeds, though beſt from cuttings, which may be taken off in autumn or ſpring; they are managed much the ſame as the currant both in planting and pruning, excepting that the extremities are commonly left in pruning.

GOOSE-NECK, among ſailors, a ſort of hook fixed in the inner end of a boom, or pole, to extend the bottom of ſome of the ſails of a ſhip, particularly the main boom of a brig or ſloop, and the lower-ſtudding-ſail booms of ſhips and larger veſſels. See the article BOOM.

The gooſe neck is hooked in a ring or eye-bolt of iron, and may be occaſionally unhooked at pleaſure.

GOOSE-WINGS *of a Sail*, the clues, or lower corners, of a ſhip's main-ſail or fore-ſail, when the middle part is tied up or furled to the yard.

The gooſe-wings are only uſed in a great ſtorm to ſcud under, when the ſail at large, or even reefed, would be too much for the ſhip to carry at ſuch a time.

GOR-COCK, a bird, otherwiſe called a moor-cock. See MOOR-COCK.

GORDIAN KNOT, in antiquity, a knot made in the leathers or harneſs of the chariot of Gordias, king of Phrygia, ſo very intricate, that there was no finding where it began or ended.

The inhabitants had a tradition, that the oracle had declared, that he who untied this knot, ſhould be maſter of Aſia. Alexander having undertaken it, was unable to accompliſh it, when fearing leſt his not untying it ſhould be deemed an ill augury, and prove a check in the way of his conqueſts, he cut it aſunder with his ſword, and thus either accompliſhed or eluded the oracle.

GORE, in heraldry, one of the abatements, which, according to Guillim, denotes a coward. It is a figure conſiſting of two arch lines drawn one from the ſiniſter chief, and the other from the ſiniſter baſe, both meeting in an acute angle in the middle of the feſs point.

GORE, in law, ſignifies a narrow ſlip of ground.

GORGE, *Gula*, in architecture, the narroweſt part of the Tuſcan and Doric capitals, lying between the aſtragal, above the ſhaft of the pillar and the annulets. See TUSCAN and DORIC.

It is alſo uſed for a concave moulding, larger, but not ſo deep as a ſcotia, which ſerves for compartments, &c. See the article COMPARTMENT.

GORGE, in fortification, the entrance of the platform of any work.

In all the outworks, the gorge is the interval betwixt the wings on the ſide of the great ditch, as the gorge of a ravelin, half-moon, &c. Theſe, it is to be obſerved, are all deſtitute of parapets; becauſe, if there were any, the beſiegers, having taken poſſeſſion of the work, might uſe it to defend themſelves from the ſhot of the place; which is the reaſon that they are only fortified with palliſadoes, to prevent a ſurprize.

The gorge of a baſtion is nothing elſe but the prolongation of the curtins from their angle with the flanks, to the center of the baſtion where they meet. When the baſtion is flat, the gorge is a right line, which terminates the diſtance between the two flanks. See the articles BASTION and FORTIFICATION.

GORGED, in heraldry, the bearing of a crown, coronet, or the like, about the neck of a lion or ſwan, and in that caſe it is ſaid, the lion or cygnet is gorged with a ducal coronet, &c.

Gorged is alſo uſed when the gorge, or neck of a peacock, ſwan, or the like bird, is of a different colour or metal from the reſt.

GORGED, among farriers, &c. ſignifies the ſame as ſwelled; in which ſenſe they ſay, the legs of a horſe are gorged; the paſtern joint is gorged; you muſt walk him out to diſgorge his ſhoulder.

GORGERIN, in architecture, the ſame with gorge. See the article GORGE.

GORGONS, in antiquity, a warlike female nation of Lybia, in Africa, who had frequent quarrels with another nation of the ſame ſex, called Amazons.

GOSHAWK, the Engliſh name of a yellow-legged falcon, with a brown back, and a white variegated breaſt.

GOSPEL, the hiſtory of the life, actions, death, reſurrection, aſcenſion, and doctrine of Jeſus Chriſt.

This hiſtory is contained in the writings of St. Matthew, St. Mark, St. Luke, and St. John; who from thence are called evangeliſts. The Chriſtian church never acknowledged any more than theſe four goſpels as canonical; notwithſtanding which, ſeveral apocryphal goſpels are handed down to us, and others are entirely loſt.

GOSSYPIUM, cotton, in botany, a genus of plants whoſe flower conſiſts of five plane patent petals, growing together at their baſes, and vertically cordated; the ſtamina are numerous, and joined in a column, and the fruit is a roundiſh capſule con-

 taining

taining four cells, which encloſes a number of oval ſeeds, ſurrounded with a downy matter called cotton. See the article COTTON.

GOTHIC, in general, whatever has any relation to the Goths: thus we ſay, Gothic cuſtoms, Gothic architecture, &c. See the article ARCHITECTURE.

Gothic architecture is far removed from the manner and proportions of the antique; having its ornaments wild and chimerical, and its profiles incorrect: however, it is frequently found very ſtrong, and appears very rich and pompous, as may be ſeen in ſeveral of our Engliſh cathedrals. This manner of building was, originally, very heavy and coarſe; but is ſince run into the oppoſite extreme, being ſlender, rich, and delicate to a fault. In the Gothic architecture we ſee high vaults raiſed on ſlender pillars; and every thing crowded with windows, roſes, croſſes, figures, &c.

GOVERNMENT, in general, is the polity of a ſtate, or an orderly power conſtituted for the public good.

GOVERNMENT is alſo a poſt or office which gives a perſon the power or right to govern or rule over a place, a city or province, either ſupremely or by deputation.

GOVERNMENT is alſo uſed for the city, country, or place to which the power of governing is extended.

GOVERNMENT, in grammer, a part of conſtruction uſually called regimen.

GOUGE, an inſtrument or tool uſed by divers artificers; being a ſort of round hollow chiſſel, for cutting holes, channels, grooves, &c. either in wood or ſtone. See JOINERY.

GOURD, *Cucurbita*, in botany. See the article CUCURBITA.

GOUT, *Arthritis*, in medicine, as defined by Boerhaave, a very painful diſeaſe, whoſe ſeat is in the joints and ligaments of the feet, and whoſe principal times of invaſion are the ſpring and autumn.

The curative intention, according to Wintringham, requires, firſt, that the primæ viæ be ſet free from a load of indigeſted crudities, and the viſcera be reſtored to their priſtine vigour; ſecondly, that the fluid ſtagnating in, and ſtuffing up the ſmaller veſſels, may be expelled the body, and a free paſſage through the contracted veſſels be reſtored.

The firſt intention may be anſwered by vomits and gentle cathartics repeated as occaſion requires; by bitters, aromatics, antiſcorbutic medicines; by alkaline fixed ſalts, taken in ſmall quantities for a long time; by aliments and drinks that are nouriſhing, light, eaſy of digeſtion, quickly aſſimilated, and taken in due quantity; by powerful exerciſe often repeated, and long continued; and eſpecially by riding in a dry, ſerene, pure air; by frictions; by motion of the affected parts; by going to ſleep at early hours.

The ſecond intention may be anſwered partly by the preceding, as well as by procuring gentle ſweats; by bathing in natural and artificial baths; by ſweating in a bagnio; or by the uſe of volatile ſalts, and copious drinking of attenuating liquors, actually hot, in the morning while in bed, in order to procure a ſweat; as alſo by mercurial purges, taking a large quantity of diluents after them; by frictions of the whole body, eſpecially the parts affected, with hot, dry, linen-cloths, till a redneſs appear; by cold baths, and the like.

To abate the exceſſive pain in the part affected, Boerhaave ſays, that if there be an abſolute neceſſity, opiates may be given internally, and the patient may drink plentifully of hot whey, or any other liquor of the like nature. Externally emollients and anodynes may be uſed, laid on pretty hot; or the part affected may be beat with nettles; or it may be anointed with terebinthinated balſam of ſulphur; or tow may be burnt thereon.

GOUT-WORT, in botany, a term ſometimes uſed for angelica. See ANGELICA.

GOUTY-LAND, among farmers, denotes a mooriſh, cold, and black ſoil, abounding with ſprings.

In Staffordſhire, this ſort of land is ordered much in the ſame manner as heathy land, only that it is uſually burnt deeper. It bears little but oats, white oats upon the gouty, and black oats upon the black cold land.

The turf of theſe grounds burnt, and carried upon rye or barley lands, is eſteemed a better improvement than dung. See the article HEATHY LAND.

GRACE, *Gratia*, among divines, ſignifies any unmerited gift which God beſtows on mankind.

Act of GRACE, an act of parliament for a general and free pardon, and for ſetting at liberty inſolvent debtors.

Days of GRACE, in commerce. See DAY.

GRACES, in heathen mythology, three goddeſſes, whoſe names were Aglia, Thalia, and Euphroſyne; that is, ſhining, flouriſhing, and gay; or, according to ſome authors, Paſithea, Euphroſyne, and Ægiale. Some make them the daughters of Jupiter and Eurynome, or Eunomia, the daughter of Oceanus; but the moſt common opinion is, that they were the daughters of Bacchus and Venus.

They are ſometimes repreſented dreſſed, but more frequently naked, to ſhew, perhaps, that whatever is truly graceful, is ſo in itſelf, without the aid of exterior ornaments. They preſided over mutual kindneſs and acknowledgement; beſtowed liberality, eloquence, and wiſdom, together with a good grace, gaiety of diſpoſition, and eaſineſs of manners.

GRACILIS, in anatomy, a muſcle of the leg, ſo called from its ſlenderneſs: it ariſes from the ſynchondroſis of the os pubis.

GRA-

GRADATION, in general, the aſcending ſtep by ſtep, or in a regular and uniform manner.

GRADATION, in architecture, a flight of ſteps, particularly aſcending from the cloiſter to the choir in churches.

It alſo denotes an artful diſpoſition of ſeveral parts, as it were by ſteps and degrees, after the manner of an amphitheatre; ſo that thoſe placed before, are rather ſerviceable than the contrary, to thoſe behind.

GRADATION, in painting, a gradual and inſenſible change of colour, by the diminution of the teints and ſhades.

GRADATION, in rhetoric, the ſame with climax. See the article CLIMAX.

GRAFT, or GRAFF, in gardening, a cion or ſhoot of a tree inſerted into another, ſo as to make it yield fruit of the ſame nature with that of the tree from whence the graft was taken.

GRAFTING, or ENGRAFTING, is the taking a ſhoot from one tree, and inſerting it into another, in ſuch a manner, that both may unite and form one tree.

There are various methods of grafting; but the following will be ſufficient to explain the manner of performing the operation; which is done about the latter end of March, or the beginning of April:

The top of the ſtock is cut off in a ſmooth, ſtraight place; then the cion, or graft, is prepared by cutting it on one ſide from the joint, or ſeam, down ſlopewiſe, making the ſlope about an inch, or an inch and an half long; and obſerving it is bent ſo that the cion may ſtand nearly upright when it is fixed to the ſtock. At the top of the ſlope a ſhoulder is made, whereby it is to reſt on the crown of the ſtock. The whole ſlope muſt be plain and ſmooth, that it may lie even to the ſide of the ſtock. The length of the cion uſed here may be about four inches from the ſhoulder, for a ſtandard tree; but for a dwarf, or wall tree, it may be ſix inches. When the cion is prepared, the outſide of its ſloped end, from the ſhoulder downwards, is applied to the weſt, or ſouth-weſt ſide of the ſtock, and its length and breadth meaſured thereon; which done, the bark of the ſtock (but not any of its wood) is cut away to thoſe dimenſions, that the cut part of the cion may be fitted in as exactly as poſſible. In doing this, regard muſt be had to the bigneſs of the ſtock, and the thickneſs of its bark, in order to proportion thereto the length and breadth of the cut part of the cion; otherwiſe the paſſages of the ſap in the ſtock and cion will not meet, and the cion will then of courſe periſh. When the cut part of the cion is exactly fitted to, and laid on that of the ſtock, they are bound together with woollen yarn, and covered with clay, an inch above and as far below the head of the ſtock; working it round the cion, till it become ſharp at top, that the rain may run down it.

Whip-GRAFTING, or *Tongue*-GRAFTING, is proper for ſmall ſtocks, from an inch diameter to a quarter of an inch, or even leſs. Mr. Worlidge, Mr. London, Mr. Miller, and others, ſpeak of it as the moſt effectual way of any, and that which is moſt in uſe, becauſe the cion covers the ſtock much ſooner in this method than in any other; for here the cion and ſtock muſt always be of the ſame thickneſs. There are three ways of performing it, and all of them may be practiſed ſomewhat later than either of the foregoing.

The firſt is, to ſlope the cion off a full inch, or more; then to do the ſame to the ſtock; and afterwards to tie the one to the other, with baſs or yarn, ſo as to join them cloſely at every part, but particularly at the rind; and then to cover the joint carefully with well-tempered clay. The baſs uſed for this, or for any other binding, ſhould be taken from a ſound mat, and be ſoaked in water for ſome hours, to increaſe its ſtrength, and render it the more pliable.

The ſecond way is, to make a ſhoulder in the graft, and, the head of the ſtock being cut off and ſmoothed, to join it.

The third method, which is an improvement of the laſt, is properly named tipping or tonguing. This is done by cutting the ſtock off ſlanting, as before, and leaving at its upper ſide a thin piece, or tongue, as it is called, of the wood, pared away like the lower end of a cion. The cion is then ſloped, and tongued, in the ſame manner as the ſtock, and a ſlit is made in each of them, downward in the ſtock, and upward in the graft, on the ſide oppoſite to the tongue, ſo that each may receive the tongue of the other. The cion is then joined to the ſtock, as cloſely as can be, particularly at the bark; a ligature is made round them with baſs or woollen yarn, and the engrafted part is well covered with clay or cement.

Root-GRAFTING, is a modern invention, the deſign of which is ſomewhat different from that of any of the former methods; this being for the propagation or multiplication of plants already fitted to produce their fruit.

To perform this, take a graft, or ſprig, of a young tree, which you intend to propagate, and a ſmall piece of the root of another tree of the ſame kind, or of a like genus, and whip-graft them together; obſerving that the butt-ends of the graft and root be well united, and that the rind of the root join cloſely to that of the graft. Theſe may, afterwards, be planted out at pleaſure, and the piece of root will collect the nutritive juices, and feed the graft, as the ſtock does the other way.

This method of propagation is very eaſy and expeditious; roots being more plentiful than ſtocks: by this means the pieces of roots of one crab-ſtock, for example, or of one apple-ſtock, will ſerve for twenty or thirty apple-grafts; and the like of other trees.

trees. It is alſo an excellent way for raiſing tender trees, which will hardly bear being graſted in the ſtock. Add, that trees thus grafted bear ſooner, and are more eaſily dwarfed, than any other way.

The only objection againſt this method is, that the young tree grows but ſlowly at firſt, which is occaſioned by the ſmallneſs of the root that feeds the graft; for in all trees the head muſt follow the increaſe of the roots, from whence it hath its nouriſhment.

Reiterated-GRAFTING, or GRAFTING *by a double*, or *triple Inciſion*, is a method mentioned by Agricola, whoſe work, though chimerical enough in many reſpects, contains, notwithſtanding, ſeveral good things. To perform this, firſt graft a good cion on a ſtock, and cut it away to one-half, or a third part; then fix to that remaining part of the cion, another graft, of a better kind; and to that a third; for the oftener the tree is grafted, the finer fruit it produces.

By this method, the author above-mentioned aſſures us, that he produced muſcat-pears, which were admirable; making, at firſt, uſe of a ſtock grafted with a pound-pear, on which he grafted a ſummer bon-chretien; and when the branch of this laſt had ſhot, he grafted on it a cion of a bergamo, which he alſo cut, and grafted on it a cion of a muſcat-pear.

GRAFTING *by Approach*, called alſo *Inarching*, and *Ablactation*, is uſed only when the tree intended to be grafted, and that from which the graft is to be taken, ſtand ſo near, or can be brought ſo near to each other that they may be joined together. The method of performing it is thus: The branch to be inarched is fitted to that part of the ſtock where it is to be joined; the rind, and part of the wood, of one ſide of that branch, is then pared away very ſmooth and even, for the length of three inches; and afterwards, the other branch, which is to ſerve for the ſtock to which the graft is to be united, is ſerved in the ſame manner, ſo that the two may join cloſely and equally together, that the ſap veſſels may meet. A little tongue is then cut upwards in the graft, and a ſlit is made in the ſtock, to receive it; ſo that when they are joined, the tongue prevents their ſlipping, and the graft is the more cloſely united to the ſtock. When they are thus placed exactly together, they muſt be tied with baſs, worſted, or ſome other ſoft thing; and the place of junction muſt be well covered over with grafting-clay, to prevent the air from drying the wound, and the wet from rotting the ſtock. A ſtake muſt alſo be fixed in the ground, and both the ſtock and the graft muſt be tied thereto, to prevent their being diſplaced by the wind. When they have remained in this ſtate four months, they will be ſufficiently united, and the graft may then be cut off from the mother tree; obſerving to ſlope it cloſe to the ſtock. It is of great ſervice to the graft then to lay a freſh coat of clay all round the grafted or jointed part. This operation ſhould be performed in April or May, that the graft may be perfectly united to the ſtock, before the enſuing winter.

This method was more practiſed formerly than at preſent, on orange-trees, jaſmines, &c. but as there are better ways to manage them, either by cuttings or inoculation, inarching is therefore little uſed, but on thoſe ſorts of plants which are of a firm contexture and ſlow growth, which will not take otherwiſe.

It may be remarked, that few trees will take on each other, unleſs they are of the ſame genus; for inſtance, a plumb cion will not take on a nut-tree, but an almond, peach, nectarine, or apricot cion, will take on a plumb ſtock, and *vice verſa*; as they are all of the ſame family, and are therefore properly claſſed together by Linnæus under the general name *prunus*, as they agree in their generical characters, by which they are diſtinguiſhed from all other trees; but many of theſe are very ſubject to emit large quantities of gum (if grafted by the afore-mentioned forms) from ſuch parts of the trees as are deeply cut and wounded, which in the tender kinds, as peaches and nectarines, are more common and hurtful; it is found by experience, as the ſafeſt method, to practiſe eſcutcheon-grafting, or, as it is more commonly called, inoculation. See the article INOCULATION.

The walnut, fig, and mulberry, will alſo take by this method of grafting, though neither of them will ſucceed in any other way: but ſtill they, like all other trees thus managed, will remain weak, and ſtinted in their growth, beſides the ſhortening of their otherwiſe uſual time of duration.

All grafts, particularly of young cions, are ſubject to be injured by birds; but that may be prevented, by binding ſome ſmall buſhes about the tops of the ſtocks.

The binding of grafts ſhould be looſened when the cions have puſhed forth about an inch and an half, or two inches, for if it is continued longer, its too great tightneſs will hinder the ſwelling of the ſtock, ſo as to hazard the cion being broke by the winds at the place of bandage: as a ſubſtitute in this caſe, if the cion is ſo ordered in cutting, that an eye be left againſt the place of junction, between the ſtock and graft, there is a probility of the bud putting forth after the damage has ſo happened, provided it is broke off above it, and thereby a year is gained.

GRAIN, a general name for all ſorts of corn, as wheat, barley, &c.

GRAIN, is alſo the name of a ſmall weight, the twentieth part of a ſcruple in apothecaries weight, and the twenty-fourth of a penny-weight troy. See the article WEIGHT.

GRAIN alſo denotes the component particles of ſtones and metals, the veins of wood, &c. Hence

croſs-grained, or againſt the grain, is contrary to the fibres of wood, &c.

GRAINING-Board, among curriers, an inſtrument (called alſo a pummel) uſed to give a grain to their leather. See the article Currying.

GRAMEN, graſs, in botany. See the article Grass.

Gramen Junceum, a name uſed by Moriſon for a ſpecies of plantain.

GRAMINEOUS Crown, in antiquity, the ſame with the obſidional one. See the article Crown.

Gramineous Plants, thoſe with narrow, oblong leaves, without any pedicle; ſuch are graſſes, pinks, &c.

GRAMMAR, γραμματικη, the art of ſpeaking and writing any language with propriety.

Grammar is alſo uſed for a book containing the rules of this art, methodically digeſted; of which there are multitudes indeed, but few good ones.

GRAMMARIAN, one that is ſkilled in, or teaches grammar.

GRAMMATICAL, in general, ſomething belonging to grammar. See the article Grammar.

GRANADIER, a ſoldier armed with a ſword, a firelock, a bayonet, and a pouch full of hand-granadoes. They wear high caps, are generally the talleſt and briſkeſt fellows, and are always the firſt upon all attacks.

Horſe-Granadiers, called by the French *grenadiers volans*, or flying-granadiers, are ſuch as are mounted on horſeback, and fight on foot: their exerciſe is the ſame with the other granadiers.

GRANADILLA, paſſion-flower, a plant called by Linnæus paſſiflora. See the article Passiflora.

GRANADO, a hollow ball or ſhell, of iron or other metal, about two inches and a half in diameter, which, being filled with fine powder, is ſet on fire by means of a ſmall ſuſee faſtened to the touch hole, made of the ſame compoſition as that of a bomb: as ſoon as the fire enters the ſhell, it burſts into many pieces, much to the damage of all that ſtand near. See the article Bomb.

Thuanus obſerves, that the firſt time grenadoes were uſed, was at the ſiege of Wachtendonck, a town near Gueldres; and that the inventor was an inhabitant of Venlo, who, in making an experiment thereof, occaſioned two-thirds of that city to be burnt, the fire being kindled by the fall of a granado.

GRANARY, a building to lay or ſtore corn in, eſpecially that deſigned to be kept a conſiderable time.

GRAND, a term borrowed from the French, implying the ſame with great.

Grand-Jury, the jury who find bills of indictment at the ſeſſions, &c. of the peace.

GRANGE, a houſe or farm furniſhed with granaries and barns for holding corn, ſtables for horſes, ſtalls for cattle, &c.

GRANIFEROUS Pods, among botaniſts, are ſuch as contain ſmall ſeeds reſembling grain.

The word is compounded of the Latin, *granum*, grain, and *fero*, to bear.

GRANITE, *Granita*, in natural hiſtory, a diſtinct genus of ſtones, compoſed of ſeparate and very large concretions, rudely compacted together, of great hardneſs, and capable of receiving a very beautiful poliſh.

GRANIVOROUS, in natural hiſtory, an epithet given to animals that feed on corn or ſeed.

The word is compounded of the Latin, *granum*, grain, and *voro*, to devour.

GRANULATION, in metallurgy, the action of reducing metals to ſmall particles in order to promote their fuſion and mixture with other bodies.

GRAPES, the fruit of the vine. See the article Vine.

Grape-Hyacinth. See the article Muscari.

GRAPHOMETER, among ſurveyors, an inſtrument for taking angles, and generally called a ſemi-circle. See Semi-Circle.

GRAPPLING, in the ſea-language, a ſort of ſmall anchor with four or five flukes or arms, commonly uſed to ride a boat. See Anchor.

Fire Grapling, an inſtrument nearly reſembling the above, only that it is fitted with ſtrong barbes in the room of flukes; and is fixed at the yard arms of a fire-ſhip, to grapple her adverſary, and ſet her on fire.

GRASS, *Gramen*, in botany, a general name for moſt of the herbaceous plants uſed in feeding cattle.

Grass-Plats, and green walks, are made, for the moſt part, not by ſowing graſs-ſeed, but by laying turfs: and, indeed, the turfs from a fine common, or down, are much preferable to ſown graſs: but if walks or plats are to be made by ſowing, the beſt way is to procure the ſeed from thoſe paſtures where the graſs is naturally fine and clear, or elſe the trouble of keeping it from ſpiry or benty graſs will be very great, and it will ſcarce ever look handſome.

In order to ſow graſs-walks, the ground muſt be firſt dug; and when it has been firſt dreſſed and laid even, it muſt be very carefully raked over, and all the clods and ſtones taken off, and then covered over an inch thick with good mould. This being done, the ſeed is to be ſown pretty thick, that it may come up cloſe and ſhort; it muſt then be raked over again, to cover the ſeed, that if the weather ſhould happen to be windy, it may not be blown away. It ought alſo to be obſerved, that where graſs is ſown in gardens, either for lawns or walks, there ſhould always be a good quantity of the white trefoil, or Dutch clover, ſown with it; for this will make a fine turf much ſooner than any other ſown

graſs, and will continue a better verdure than any other of the graſs tribe.

In order to keep graſs-plats or walks handſome, and in good order, you may ſow in autumn freſh ſeed over any places that are not well filled, or where the graſs is dead; but nothing improves graſs ſo much, as mowing and conſtant rolling.

When turf is laid in gardens, it is a general practice to cover the ſurface of the ground, under the turf, either with ſand or very poor earth; the deſign of this is, to keep the graſs fine, by preventing its growing too rank. This is proper enough for very rich ground, but it is not ſo for land that is poor; for when this is practiſed in ſuch places, the graſs will ſoon wear out and decay in patches.

GRASSHOPPER, in zoology, a ſpecies of the gryllus, frequent in paſtures. See GRYLLUS.

GRATINGS, in ſhip-building, certain hatches or covers laid over the hatchways of a ſhip, and croſſed with battens of wood, ſo as to let the light down between the decks of a ſhip. See HATCHES.

GRATIOLA, hedge-hyſſop, in botany, a genus of plants, whoſe flower is monopetalous and ringent; it hath five ſubulated filaments, topped with roundiſh antheræ. The fruit is an oval, acuminated capſule, compoſed of two valves, and containing two cells, which are filled with a number of ſmall ſeeds.

It is good in dropſies, jaundices, and other chronic complaints, taken in infuſion; and though a rough and violent medicine, is reckoned a very powerful one.

GRAVE, in muſic, is applied to a ſound of a low or deep tone.

GRAVE *Accent*, in grammar, is a mark placed in this manner [`] over ſome vowel, and implies that the voice ſhould be lowered in pronouncing that ſyllable.

GRAVEL, in natural hiſtory, is a congeries of ſmall pebbles, which, being mixed with a ſtiff loam, makes laſting and elegant walks in our gardens.

Opinions, with regard to the choice of gravel, are various; ſome are for having it as white as poſſible, and in order to render it the more ſo, cauſe the walks to be often rolled with ſtone rollers, which add a whiteneſs to the ſurface. But this renders them very troubleſome to the eyes, by reflecting too ſtrongly the rays of light: ſuch gravel, therefore, as will lie ſmooth and reflect the leaſt, ſhould be preferred. Again, ſome ſcreen the gravel too fine, but this is an error; for if it be caſt into a round heap, and the great ſtones only are raked off, it will be the better. There are many kinds of gravel which do not bind, and by this means cauſe a continual trouble of rolling, to little or no purpoſe; as for ſuch, if the gravel be looſe or ſandy, you ſhould take one load of ſtrong loam and two of gravel, and ſo caſt them well together.

The beſt and moſt eſteemed gravel is that of Black-heath, in Kent, which being mixed with a proper proportion of loam (found alſo on the ſame common) makes the moſt beautiful and laſting walks any where; nor is it confined to a few places about London, for we have known ſeveral tons of it exported to adorn the pope's garden at Rome, although it may be ſuppoſed ſo much beneath his holineſs's dignity to tread upon it; but Italy cannot produce a more handſome terra firma.

The month of March is the propereſt time for laying gravel; for it is not prudent to do it ſooner, or to lay walks in any of the winter months before that time. In making theſe walks, great regard muſt be had to the level of the ground, ſo as to lay the walks with eaſy deſcents toward the low parts of the ground, that the wet may be eaſily drained off: but when the ground is level, it will be proper to have ſink-ſtones laid by the ſides of the walk, and at convenient diſtances, to let off the wet; and when the ground is naturally dry, the drains from the ſink-ſtones may be contrived ſo as to convey the water into ſeſſpools, from which the water will ſoak away in a ſhort time; but in wet lands there ſhould be under-ground drains, to convey the water off, either into ponds, ditches, or the neareſt place proper to receive it.

Some are apt to lay gravel-walks too round, but this is an error; becauſe they are not ſo good to walk upon; and beſides, it makes them look narrow; one inch is enough in a crown of five feet; and it will be ſufficient, if a walk be ten feet wide, that it lies two inches higher in the middle than it does on each ſide; if fifteen feet, three inches; if twenty feet, four inches; and ſo in proportion.

For the depth of gravel-walks, ſix or eight inches may do well enough; and a foot in thickneſs will be ſufficient for any; but then there ſhould always be a depth of rubbiſh laid under the gravel, eſpecially if the ground be wet.

Some turn up gravel-walks into ridges, in December, in order to kill the weeds; but this is very wrong, ſince it never anſwers the end; and, therefore, if conſtantly rolling them after rain and froſt, will not effectually kill the weeds and moſs, you ſhould turn the walks in March, and lay them down at the ſame time.

In order to deſtroy worms that ſpoil the beauty of gravel or graſs walks, ſome recommend the watering them with water made very bitter, by ſteeping walnut-tree leaves in it; but if, in the firſt laying of the walks, there be a good bed of lime-rubbiſh laid at the bottom, it will prove the moſt effectual method to keep out the worms, for they never harbour near lime.

GRAVEL-BIND. See the article CONVOLVULUS.

GRAVEL, in medicine, a very painful diſtemper, ariſing from a gritty matter concreting into ſmall

ſmall ſtones in the kidneys and bladder. See the article STONE.

GRAVELLING, an accident that often happens to a horſe in travelling, occaſioned by ſome ſmall gravel ſtones getting between the hoof and the ſhoe, where they feſter and fret the part.

It is cured by taking off the ſhoe, picking out all the gravel, waſhing the part affected, and then pouring upon it hot, a compoſition of ſheep's tallow and bay ſalt melted together.

GRAVELLY *Land*, that which abounds with gravel and ſand.

The beſt manure of theſe lands is marl, or any ſtiff clay that will diſſolve with the froſt, cow dung, chalk, mud, and half rotten ſtraw from the dunghill.

GRAVER, the name of a tool by which all the lines, ſcratches, and ſhades, are engraved on copper, &c.

There are three ſorts of gravers, round-pointed, ſquare-pointed, and lozenge-pointed. The round are beſt for ſcratching; the ſquare-pointed for cutting the larger ſtrokes; and the lozenge-pointed for the moſt delicate ſtrokes: but a graver of a middle form, between the ſquare and lozenge pointed, will make the ſtrokes or hatches appear with more life and vigour. See ENGRAVING.

GRAVING, among ſea-men, the act of cleaning a ſhip's bottom. See CAREEN and DOCK, where this operation is particularly explained.

GRAVITATION, in philoſophy, the preſſure which one body exerts upon another by reaſon of its gravity. See ATTRACTION.

GRAVITY, the natural tendency which all bodies have towards a center. See ATTRACTION.

GRAVITY, in mechanics, the tendency of bodies towards the center of the earth. Gravity is of two kinds, abſolute and relative, or ſpecific.

Abſolute GRAVITY is the whole force with which a body tends downwards, or towards the center of the earth, and is always equal to the quantity of matter the body contains, without any regard to its bulk; ſo that the abſolute gravity of a pound of wood is equal to that of a pound of iron.

Relative or *Specific* GRAVITY is the exceſs of gravity of one body above that of another of equal dimenſions, and is always proportionable to the quantity of matter under that dimenſion. Thus a cubic inch of iron is heavier than a cubic inch of wood; for the iron being more denſe than the wood, contains a greater quantity of matter under the ſame bulk.

For the method of finding the ſpecific gravities of bodies, ſee *Hydroſtatical* BALANCE.

GRAVITY *of the Air*. See AIR and ATMOSPHERE.

GRAY, or GREY, in horſemanſhip. See the article GREY.

GREASE, in farriery, a ſwelling and gourdineſs of the legs of a horſe.

This diſeaſe is generally the effects of a faulty blood, and happens moſtly to horſes of a groſs conſtitution; ſometimes it is owing to careleſſneſs in the perſons that look after them, for want of keeping their limbs clean and dry; but for the moſt part horſes that run late in the winter at graſs are the moſt ſubject to it; their blood by that means growing poor and dropſical, expoſes them firſt to ſwell in their limbs, and then to eruptions, which diſcharge a fœtid ſtinking matter reſembling melted glue, and when it turns ſharp and corroſive, it becomes very troubleſome. Sometimes the greaſe breaks out only behind, ſometimes before; and when the conſtitution is very bad, it will break out in all the four limbs at the ſame time.

When the heels are very much ſwelled and full of hard ſcabs, it is neceſſary to begin the cure with poultices, which may be made with either turneps or rye-flower, turpentine, and hogs lard, mixed with ſpirit of wine or red wine-lees; and when the horſe comes to move his limbs with leſs ſtiffneſs, it will be proper to purge him, which, in ſome caſes, muſt be repeated five or ſix times before you can obtain the deſired effect. Where there are pretty large ſwellings in the limbs, diuretics that work powerfully by urine, often ſucceed better than purges.

Molten GREASE, a diſtemper incident to very fat horſes from over-riding, or any violent exerciſe.

It is known by the horſe's voiding a greaſy matter with his dung; though this ſymptom ſometimes attends fat horſes that ſtand much in the ſtable, and have but very little exerciſe, on their catching the leaſt cold. But when a horſe's greaſe is really melted, it is always accompanied with a fever, heat, reſtleſſneſs, ſtarting tremors or tremblings, great inward ſickneſs, ſhortneſs of breath, and ſometimes with the ſymptoms of a pleuriſy.

In order to cure this diſeaſe, it is neceſſary to bleed plentifully in order to empty the veſſels; and ſeveral rowels or iſſues ſhould be cut in different parts of his body. Glyſters are alſo of great ſervice, and ought to be rather of the emollient kind, than purgative, as they are principally intended to cool the inteſtines; all the other internals ought likewiſe to be cleanſing, attenuating, and opening.

GREAT, a term of compariſon, applied to things of large or extraordinary dimenſions, &c.

GREAT *Circles of the Sphere*, are ſuch as divide the ſphere into two equal parts or hemiſpheres, in contradiſtinction to the leſſer circles, which cut the ſphere into unequal parts. See SPHERE.

GREAT *Circle Sailing*. See the article SAILING.

GREEK, or GRECIAN, ſomething relating to ancient Greece.

GREEK *Bible*. See the article BIBLE.

GREEK *Church*, that part of the Chriſtian church eſtabliſhed in Greece and other parts of Turkey.

GREEK *Language*, the language ſpoken by the ancient Greeks, and ſtill preſerved in the writings of Plato, Ariſtotle, Demoſthenes, Thucydides, Xenophon, Homer, Heſiod, &c.

The Greek language was that of a people who had a taſte for the arts and ſciences, which they happily cultivated; and hence it abounds with very ſignificative terms, which are often borrowed by the moderns, and applied to any new diſcovery, inſtrument, machine, &c.

GREEK *Orders*, in architecture, are the Doric, Ionic, and Corinthian; the other two, namely, the Tuſcan and Compoſite, being called the Latin orders.

GREEK *Valerian*, in botany. See POLEMONIUM.

GREEN, one of the original colours of the rays of light. See the article COLOUR.

GREEN, among painters and dyers, is a colour produced by a mixture of yellow and blue, which will be either deeper or lighter in proportion to the quantity of yellow uſed in the compoſition.

GREEN-CLOTH, a board or court of juſtice, held in the compting-houſe of the king's houſhold, compoſed of the lord-ſteward, and the officers under him, who ſit daily, and take cognizance of matters of juſtice within the verge of the court, which extends about two hundred yards every way from the laſt gate of the palace where his majeſty reſides.

GREEN-FINCH, in ornithology, the Engliſh name of the greeniſh fringilla, having its wings and tail variegated with yellow. It is a very common bird with us, and ſomething larger than the chaffinch.

GREENHOUSE, a conſervatory, or houſe erected in a garden, for the preſervation of thoſe ſorts of plants which cannot endure the cold of our winters if expoſed to the open air.

A greenhouſe is diſtinguiſhed from a ſtove to hot-houſe by its not having much artificial heat uſed in it; therefore thoſe plants which are uſually placed in it are not very tender, and will bear to be out in the open air during the ſummer ſeaſon. In plate LX. *fig.* 1. is exhibited a view of a greenhouſe with two glaſs caſes adjoining to the ends; theſe may be uſed for the preſervation of ſucculent plants, or for forcing roſes, ſtrawberries, &c. according to the fancy of the owner; and vines may be trained within-ſide from the bottom without, whereby in ſummer they will produce excellent bunches of the fineſt and moſt delicious grapes, of thoſe ſorts which would not ripen without doors with us, and would alſo be a good ſucceſſion to thoſe grapes which are forced in the ſtove. The length of theſe glaſs caſes may be from ten to twenty-five feet, and eight or nine feet in width, with flues, *f*, in the back, to be uſed in damp or froſty weather; the door-way, *a*, at thoſe times may be opened, which will admit from the glaſs-caſes ſo much warmth into the greenhouſe as to keep out the froſt, which is all the artificial heat required. The upper part of the ſouth ſide of the roof of the greenhouſe may be tiled or ſlated, under which ſhutters ſhould be ſo contrived that by means of lines and pullies they may be let down on the glaſſes or pulled up at pleaſure, theſe will be a good ſecurity againſt froſt, ſnow, or hail; the pillars in front ſhould not be broader than may be thought neceſſary for the ſupport of the roof, for there cannot be too much light in a greenhouſe; the glaſſes in front ſhould be ſliding ſaſhes, in order to give air to the plants at proper times; theſe ſhould have ſhutters which may fold back againſt the piers within ſide, the middle one ſhould be a glaſs door, for the conveniency of bringing in or carrying out the plants; this need not be uſed at other times, as there are other entrances into the greenhouſe, as out of the glaſs caſes at *a*, or from the ſheds at *b*; theſe ſheds are very convenient for tools and other purpoſes, as likewiſe they keep the back of the caſes warm; and it would not be amiſs if one was continued behind the greenhouſe, to prevent the froſt and damps entering that way, otherwiſe the back requires a greater thickneſs of brick-work. In the ſection, the ſpace marked *r*, between the roof and the ceiling *c*, ſhould be filled up with ſtraw, peaſe-haum, reeds, fern, or ſome ſuch matter, to prevent the froſt penetrating that way. The depth of the greenhouſe ſhould not be leſs than twelve feet, nor more than twenty, we think about fifteen or ſixteen feet a good dimenſion for if it exceeds twenty, there muſt be more rows of plants placed to fill the houſe than can with convenience be reached in watering and cleaning; nor are houſes of too great depth ſo proper for keeping of plants as thoſe of a moderate ſize: as to the length, it ſhould be proportioned to the quantity of plants it is to contain; about fifty feet is a moderate length, when the width is about fifteen, for if it is longer, the middle part of the houſe will receive no benefit of the fires in ſevere froſts. The height of the faſhes in front of the greenhouſe may be from eight to ſixteen feet, and ſhould be glazed with crown glaſs, but the ſlope parts of both places ſhould be glazed with green glaſs, for if they are glazed with crown glaſs, the leaves of the plants are very apt to be burnt in different places, in hot ſun ſhine days in March or April, which frequently happens by the uneven panes collecting the rays of the ſun to a focus, but the green glaſs is not ſo likely to do ſo: the cieling and the walls ſhould be ſtuccoed, or plaiſtered and white-waſhed, but ſtucco is beſt, as it does not rub or peel off; this is neceſſary to help to keep out the froſts, as alſo to reflect

Greenhouse.

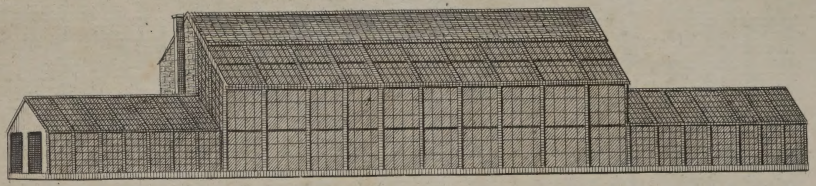


Fig. 1.

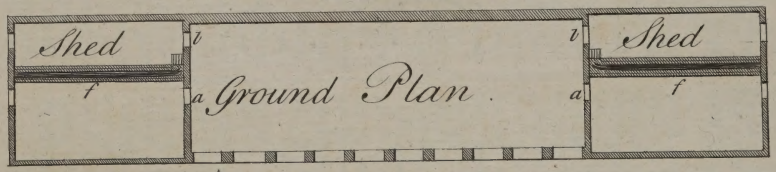


Fig. 3. Honey-comb.

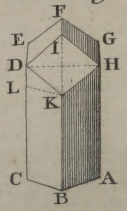


Fig. 2. Hexagon.

Fig. 1. Section.

reflect the light, for there cannot be too much light, as was obſerved before. The floor of the greenhouſe, &c. which ſhould be laid either with Bremen ſquares, Purbeck ſtone, broad tyles, or hard bricks, according to the fancy of the owner, muſt be raiſed a foot at leaſt above the ſurface of the ground whereon the houſe is placed; but if the ſituation is moiſt and ſpringy, and thereby ſubject to damps, it ſhould be raiſed at leaſt three feet above the ſurface; and if the whole is arched with low brick arches under the floor, it will be of great ſervice in preventing the damps riſing in winter, which are often very hurtful to the plants, eſpecially in great thaws, when the air is often too cold to be admitted into the houſe to take off the damps.

In this greenhouſe the plants are to be diſpoſed ſo as to form a riſing ſurface from the front to the back; truſſels of different heights are neceſſary to place the plants on when their heights are too equal, the loweſt row ſhould be forwardeſt next the windows, leaving a ſpace to walk along; the rows of plants ſhould riſe gradually from the firſt, in ſuch a manner that the heads of the ſecond row ſhould be entirely advanced above the firſt, the ſtems being only hid thereby, and ſo on for the reſt. At the back of the houſe within-ſide there ſhould be a paſſage left of four or five feet, for the conveniency of watering the plants, as alſo to admit of a current of air round them, that the damps occaſioned by the perſpiration of the plants may be better diſſipated, which by being pent in too cloſely often occaſions a mouldineſs upon the tender ſhoots and leaves; and when the houſe is cloſe ſhut up, this ſtagnating rancid vapour is often very deſtructive to the plants, for which reaſon they ſhould never be crowded cloſe together. In the principal houſe ſhould be placed the moſt admired evergreens, ſuch as orange, lemon, and citron trees, myrtles, geraniums, &c. the lemon and citron trees next the fire (ſee the plan) they being more tender than the orange; and where there are various ſorts of plants they ſhould be ſo diſpoſed that their different foliage and tints of green may make an agreeable contraſt; but as to the ſeveral ſorts of ſucculent plants, ſuch as aloes, ſedums, torch-thiſtles, melon-thiſtles, euphorbiums, &c. (as was before obſerved) they ſhould be placed in the glaſs-caſe by themſelves, as there is a great difference in nature between evergreens, herbaceous plants, and thoſe we call ſucculent.

The ſloping glaſſes of theſe caſes ſhould be made to ſlide, the upper ones over the lower, which may be fixed, as alſo the front glaſſes may be contrived one to ſlide by the other, this is abſolutely neceſſary to admit air to the plants in warm weather in a greater or leſſer quantity according as there may be occaſion.

But, beſides the conſervatories here mentioned, it will be proper to have a deep hot bed frame, ſuch as is commonly uſed to raiſe large annuals in the ſpring; into which may be ſet pots of ſuch plants as come from Carolina, Virginia, &c. while the plants are too ſmall to plant in the open air; as alſo may other ſorts from Spain, &c. which require only to be ſcreened from the violence of the froſts, and ſhould have as much free air as poſſible in mild weather; which can be no better effected than in one of theſe frames, where the glaſſes may be taken off every day when the weather will permit, and put on every night; and in hard froſts, the glaſs may be covered with mats, ſtraw, peaſe-haulm, or the like, ſo as to prevent the froſt from entering the pots to freeze the roots of the plants, which is what will, many times, utterly deſtroy them; though a ſlight froſt pinching the leaves or ſhoots very ſeldom does them much harm: if theſe are ſunk a foot or more below the ſurface of the ground, they will be the better, provided the ground is dry; otherwiſe they muſt be wholly above ground: the ſides of this frame ſhould be built with brick, with a curb of wood laid round on the top of the wall, into which the gutters, on which the glaſſes ſlide, may be laid: the back wall of this frame may be about five feet high, and the front three feet, the width about ſix feet, and the length in proportion to the number of plants: as the plants which this frame is deſigned to protect during the winter are hardy enough to admit of being removed out of it in April, it may be uſed for raiſing in the ſummer a crop of melons, &c. which will keep it fully employed all the year.

GREGARIOUS, an epithet applied to ſuch animals as live together in flocks or herds.

GREGORIAN *Calendar*. See the article CALENDAR.

GREGORIAN *Year*. See YEAR.

GREWIA, in botany, a genus of plants whoſe flower conſiſts of a coriaceous coloured calyx, compoſed of five lanceolated leaves, the corolla is formed of five petals of the ſhape of the cup, but leſs, and emarginated at the baſe; the ſtamina are compoſed of a very great number of ſetaceous filaments, topped with roundiſh antheræ. The fruit is a quadrangular berry having four cells, each incloſing a globoſe ſeed.

GREWT, among miners, implies earth of a different colour from the reſt, found on the banks of rivers as they are ſearching for mines.

GREY, or GRAY, a mixed colour compounded of black and white. See COLOUR.

GRIFFON, in heraldry, an imaginary animal, ſuppoſed by the ancients to be half eagle and half lion.

GRINDING, *Trituratio*, the reducing hard ſubſtances to fine powders, by means of mills, rubbing them in a mortar, or with a muller on a marble.

GRIPE, in huſbandry, a ſmall ditch cut acroſs a meadow or ploughed land, in order to drain it.

GRIPES, among ſailors, certain ropes hooked to the decks of a ſhip, and drawn tight over the boats, to ſecure and prevent them from being ſhaken by the agitation of a ſhip at ſea.

GRIPING, in the ſea language, the inclination of a ſhip to run to the windward of her courſe, when ſhe ſteers with a wind on either quarter.

This is partly occaſioned by the ſhock of the waves which ſtrike her on her weather-quarter, but chiefly by the arrangement of the ſails, which diſpoſe her at ſuch a time to edge continually to windward. See the article QUARTER.

GRIST, in country affairs, implies corn already ground or ready for grinding.

GROAT, an Engliſh money of account, equal to four-pence.

GROGRAM, among manufacturers, a kind of ſtuff compoſed of ſilk and mohair.

GROIN, *Pubes*, in anatomy. See the article PUBES.

GROOM, a name applied to ſeveral ſuperior officers belonging to the king's houſhold.

GROOM is more particularly uſed for a ſervant appointed to attend horſes in the ſtable.

GROMMET, among ſailors, a ſort of wreath or ring of rope to faſten a ſail to any ſtay, upon which it is drawn along at the time of hoiſting and lowering it, by the help of theſe grommets, as a curtain is extended or drawn together along its rod by the aſſiſtance of rings.

GROOVE, among miners, the ſhaft or pit ſunk into the earth, whether in the vein or not.

GROOVE, among joiners, implies the channel made by their plough in the edge of a moulding, &c.

GROSS-WEIGHT, among merchants, ſignifies the whole weight of any commodity, including the duſt, droſs, and bag, cheſt, &c. in which it is contained.

GROSSULARIA, the gooſeberry and currant-buſhes. See RIBES and GOOSEBERRY.

GROTESQUE, ſomething whimſical, extravagant, and monſtrous.

GROTTO, in natural hiſtory, a large deep cavern in ſome rock or mountain.

GROTTO is alſo uſed for a ſmall artificial edifice made in a garden, in imitation of a natural grotto.

The outſides of theſe grottos are uſually adorned with ruſtic architecture, and their inſide with ſhell-work, coral, &c. and alſo furniſhed with various fountains, and other ornaments.

GROVE, in gardening, a ſmall wood impervious to the rays of the ſun.

Groves are the greateſt ornaments to a garden; nor can a garden be complete which has not one or more of theſe. In ſmall gardens there is ſcarce room to admit of groves of any extent: yet, in theſe, there ſhould be at leaſt one contrived, which ſhould be as large as the ground will allow it: and, where theſe are ſmall, there is more ſkill required in the diſpoſition, to give them the appearance of being larger than they really are.

Groves are of two ſorts, viz. open and cloſe; open groves are ſuch as have large ſhady trees, which ſtand at ſuch diſtances, as that their branches may approach ſo near to each other, as to prevent the rays of the ſun from penetrating through them: but as ſuch trees are a long time in growing to a proper ſize for affording a ſhade, ſo, where new groves are placed, the trees muſt be placed cloſer together, in order to have ſhade as ſoon as poſſible; but, in planting of theſe groves, it is much the beſt way to diſpoſe all theſe trees irregularly, which will give them a greater magnificence, and alſo form a ſhade ſooner, than when the trees are planted in lines; for, when the ſun ſhines between the rows of trees, as it muſt do ſome part of the day in ſummer, the walks between them will be expoſed to the heat, at ſuch times, until the branches of theſe trees meet; whereas, in the irregular plantations, the trees intervene, and obſtruct the direct rays of the ſun.

When a perſon, who is to lay out a garden, is ſo happy as to meet with large full grown trees upon the ſpot, they ſhould remain inviolate, if poſſible; for it will be better to put up with many inconveniencies, than to deſtroy theſe, which will require an age to retrieve; ſo that nothing but that of offending the habitation, by being ſo near as to occaſion great damps, ſhould tempt the cutting them down.

Moſt of the groves which have been planted either in England, or thoſe celebrated gardens in France, are only a few regular lines of trees; many of which join to the habitation, or lead to ſome building, or other object: but theſe do not appear ſo grand, as thoſe which have been made in woods, where the trees have grown accidentally, and at irregular diſtances; where the trees have large ſpreading heads, and are left at ſuch diſtance as to permit the graſs to grow under them, then they afford the greateſt pleaſure; for nothing is more noble than fine ſpreading trees with large ſtems, growing through graſs, eſpecially if the graſs is well kept, and has a good verdure; beſide, moſt of theſe planted groves have generally a gravel walk, made in a ſtraight line between them; which greatly offends the ſight of perſons who have a true taſte: therefore, whenever a gravel walk is abſolutely neceſſary to be carried through theſe groves, it will be much better to twiſt it about, according as the trees naturally ſtand, than to attempt regularity: but dry walks under large trees are not ſo uſeful as in open places; becauſe the dropping of the trees will render theſe walks uſeleſs, after rain, for a conſiderable time.

Cloſe groves have frequently large trees ſtanding in them; but the ground is filled under theſe with ſhrubs, or under-wood; ſo that the walks which are

made

made in them are private, and ſcreened from the winds; whereby they are made agreeable for walking, at ſuch times when the air is too violent or cold for walking in the more expoſed part of the garden.

Theſe are often contrived ſo as to bound the open groves, and frequently to hide the walls, or other incloſures, of the garden: and when they are properly laid out, with dry walks winding through them, and on the ſides of theſe, ſweet-ſmelling ſhrubs and flowers irregularly planted, they have a charming effect: for here a perſon may walk in private, ſheltered from the inclemency of cold or violent winds, and enjoy the greateſt ſweets of the vegetable kingdom: therefore, where it can be admitted, if they are continued round the whole incloſure of the garden, there will be a much greater extent of walk: and theſe ſhrubs will appear the beſt boundary where there are not fine proſpects to be gained.

Theſe cloſe groves are by the French termed boſquets, from the Italian word boſquetto, which ſignifies a little wood: and in moſt of the French gardens there are many of them planted; but theſe are reduced to regular figures, as ovals, triangles, ſquares, and ſtars: but theſe have neither the beauty or uſe which thoſe have that are made irregularly, and whoſe walks are not ſhut on each ſide by hedges, which prevents the eye from ſeeing the quarters; and theſe want the frangrancy of the ſhrubs and flowers, which are the great delight of theſe private walks; add to this, the keeping of the hedges in good order, is attended with a great expence; which is a capital thing to be conſidered in the making of gardens. *Miller's Gard. Dict.*

GROUND, in agriculture; ſee EARTH and SOIL.

GROUND, in painting, the ſurface upon which the figures and other objects are repreſented.

The ground is properly underſtood of ſuch parts of the piece as have nothing painted on them, but retain the original colours upon which the other colours are applied to make the repreſentations.

A building is ſaid to ſerve as a ground to a figure, when the figure is painted on the building.

GROUND-ANGLING, a method of angling without a float, only with a plumb of lead, or rather a bullet, becauſe it will roll on the ground.

GROUND-IVY, hedera terriſtris, in botany; ſee IVY.

GROUND-PINE, in botany; ſee CHAMEPITYS.

GROUND-TAKLE, among ſailors, all ſorts of ropes which belong to the anchors, or for mooring a ſhip; as cables, hawſers, tow-lines, warps, buoy-ropes, &c.

GROUND-WORK, among builders; ſee FOUNDATION.

GROUNDING, in the ſea language, a ſhip is ſaid to ground when ſhe ſtrikes and reſts upon the ground.

GROUNDSEL, in botany; ſee SENECIO.

GROUP, in painting and ſculpture, an aſſemblage of two or more figures of men, beaſts, fruits, &c. which have ſome apparent reſemblance to one another.

GROUSE, or GROWSE, the name of a very valuable bird, of the ſize of a full-grown foul. Its head is large, and adorned with a very beautiful ſcarlet protuberance over the eyes, which are remarkably piercing. It is a native of England, tho' not very common, and lives on large mountainous heaths.

GROWAN, among the Corniſh miners, implies a coarſe gritty ſtone of a greyiſh colour, which they are often obliged to dig through, before they reach the tin ore.

GRUB, the Engliſh name of the hexapode worms, or maggots, hatched from the eggs of beetles.

GRUBS, in medicine, certain unctuous pimples riſing on different parts of the face, particularly in the alæ of the noſe. They are cured by cooling phyſic, and ſuch medicines as have a tendency to cleanſe the blood.

GRUBBING, a term uſed by our farmers to ſignify the taking up the roots of trees.

GRUME, *Grumus*, in medicine, implies a concreted clot of blood, milk, or other ſimilar ſubſtance.

GRUS, the crane, in ornithology, a bird of the heron kind. See CRANE.

GRYLLOTALPA, the mole cricket, in natural hiſtory, a creature approaching to the locuſt kind, and very properly called by this name by Moſfet, as it has much of the form of the cricket, and makes a noiſe like it in the evening; and is, like the mole, continually employed in digging the ground.

GRYLLUS, in zoology, the name of the cricket and locuſt kind, which, together with the graſshopper, form one genus of inſects.

GUAIACUM, or GUAJACUM, in botany, a genus of plants, the flower of which conſiſts of a monophyllous cup, cut into five parts, the corolla is compoſed of five obato-oblong concave petals, which ſpread open. The fruit is a roundiſh, obliquely acuminated drupe, deeply furrowed, incloſing a hard nut.

The wood of guaiacum is extremely hard and ſolid, of a denſe compact texture, and remarkably heavy, ſo as to ſink in water; it is of a blackiſh yellow colour in the middle, and ſometimes variegated. This wood comes over in large pieces, weighing four, five, or more, hundred weight, from Jamaica, Mexico, Porto-rico, St. Domingo, and other parts of the Weſt-Indies; it is of a fragrant ſmell, and

and of an aromatic and pungent, but ſomewhat bitteriſh, taſte.

When the tree is ſtanding, or newly felled, the bark adheres ſo firmly as not to be got off even with iron tools; after lying for ſome time it ſeparates eaſily. On account of its great hardneſs, ſolidity, and indiſpoſition to crack, it is employed by the turners, and others, for ſeveral of the more curious mechanic uſes. In Holland, at Hamburg, and other places of large commerce, it is raſped in work-houſes eſtabliſhed for that purpoſe, after the ſame manner as the colouring-woods; and from theſe the druggiſt and apothecary are ſupplied.

A ſtrong decoction of guaiacum is uſed as an alterative diet-drink in venereal, cancerous, and other diſorders, from an impurity of the blood and juices. Hoffman recommends the ſpirituous extract (which is the moſt active preparation) as a high antidote againſt the venereal poiſon, provided it be uſed properly, according to the laws of medicine. He mentions alſo another reſinous preparation of this wood, under the title of "A ſingular reſin, of a ſtimulating errhine quality, and poſſeſſing alſo a corroborating power, highly friendly to the nervous parts of the head." This, according to his account, is the reſin that precipitates in boiling down a watery decoction of the wood.

Gum-GUAIACUM, ſo called, is a reſin exuding from the guaiacum-tree. It is of a brown colour, partly reddiſh, and often greeniſh, brittle, of a gloſſy ſurface when broke, of a pungent taſte; and when rubbed or heated, of a not diſagreeable ſmell: its ſmoke, in burning, has ſomewhat the ſmell of that of wood. Such ſhould be choſen as has pieces of the bark adhering, and eaſily parts from them by a few quick blows. The maſſes which have no bark, eſpecially the large ones, are often ſophiſticated. I received for gum-guaiacum, a whole box of an artificial compoſition of colophony and balſam of ſulphur: this abuſe was readily diſtinguiſhable by the ſmell of the compound, when laid upon burning coals, and even by its appearance upon breaking.

Out of an ounce of gum-guaiacum, rectified ſpirit of wine diſſolves ſix drams and two ſcruples: of the remainder, water applied at firſt, extracts four ſcruples out of an ounce: of the reſiduum, ſpirit diſſolves four drams and two ſcruples. In diſtillation, it gives over a little both to water and to ſpirit, ſo little as to be altogether inconſiderable.

Its virtues are the ſame with thoſe of the wood. It is uſed pretty frequently in England, very rarely in Germany, the pure reſin artificially extracted from the wood by means of ſpirit of wine, advantageouſly and elegantly ſupplying its place.

GUAJAVA, or GUAVA, in botany, the name by which Tournefort calls the pſidium of Linnæus. See PSIDIUM.

GUANABANUS, the cuſtard-apple, in botany, a genus of plants whoſe characters are as follow:

The empalement of the flower conſiſts of three ſmall pointed leaves; the flowers of ſome ſorts have only three petals, but in others ſix; in the latter, three are alternately leſs than the others: from the empalement ariſes the pointal, which afterwards becomes an oval, or round, fleſhy, ſoft fruit, incloſing ſeveral oblong, ſmooth, hard ſeeds.

GUARANTY, in policy, the engagement of neutral kindoms or ſtates, whereby they undertake that certain treaties ſhould be inviolably obſerved.

GUARD, in a general ſenſe, ſignifies the defence or preſervation of any thing; the act of obſerving what paſſes, in order to prevent ſurprize; or the care, precaution, and attention we make uſe of, to prevent any thing happening contrary to our intention and inclinations.

GUARD, in the military art, is a duty performed by a body of men, to ſecure an army or place from being ſurprized by an enemy.

In a garriſon, the guards are relieved every day, and it comes to every ſoldier's turn once in three days; ſo that they have two nights in bed, and one upon guard.

To be upon guard, to mount the guard, to diſmount the guard, to relieve the guard, to change the guard, the officer of the guard, or the ſerjeant of the guard, are words often uſed, and well underſtood.

Advanced-GUARD is a party of either horſe or foot, that marches before a more conſiderable body, to give notice of any approaching danger.

When an army is upon the march, the grand-guards, which ſhould mount that day, ſerve as an advanced-guard to the army: in ſmall parties, ſix or eight horſe are ſufficient, and theſe are not to go above four or five hundred yards before the party.

An advanced-guard is alſo a ſmall body of twelve or ſixteen horſe, under a corporal, or quarter-maſter, poſted before the grand-guard of a camp.

Artillery-GUARD is a detachment from the army to ſecure the artillery; their corps-de-garde is in the front, and the centries round the part. This is a forty-eight hours guard: and upon a march, they go in the front and rear of the artillery, and muſt be ſure to leave nothing behind; if a gun or waggon break down, the captain is to leave a part of his guard to aſſiſt the gunners and matroſſes in getting it up again.

Corps-de-GARDE, are ſoldiers entruſted with the guard of a poſt, under the command of one or more officers.

Counter-GUARD, in fortification. See the article COUNTER-GUARD.

Forrage-GUARD, a detachment ſent out to ſecure the forragers, which are poſted at all places, where either the enemy's party may come to diſturb the forragers;

forragers; or where they may be ſpread too near the enemy, ſo as to be in danger of being taken. They conſiſt both of horſe and foot, and muſt ſtay at their poſts till the forragers all come off the ground.

Grand-GUARD, three or four ſquadrons of horſe, commanded by a field-officer, poſted at about a mile and a half from the camp, on the right and left wings, towards the enemy, for the ſecurity of the camp.

Main-GUARD, that from whence all the other guards are detached.

Picquet-GUARD, a good number of horſe and foot always in readineſs in caſe of an alarm: the horſe are all the time ſaddled, and the riders booted. The foot draw up at the head of the battalion, at the beating of the tattoo; but afterwards return to their tents, where they hold themſelves in readineſs to march, upon any ſudden alarm. This guard is to make reſiſtance, in caſe of an attack, till the army can get ready.

Quarter-GUARD, a ſmall guard, commanded by a ſubaltern officer, poſted by each battalion, about an hundred yards before the front of the regiment.

Rear-GUARD, that part of the army which brings up the rear, which is generally the old grand-guards of the camp. The rear-guard of a party is ſix or eight horſe, that march about four or five hundred paces behind the party. The advanced-guard of a party on its going out, make the rear-guard on its return.

Standard-GUARD, a ſmall guard, under a corporal, out of each regiment of horſe, and placed on foot, in the front of each regiment.

Van-GUARD, that part of the army which marches in the front.

GUARDS alſo imply the troops kept to guard the king's perſon.

Yeomen of the GUARDS. See YEOMEN.

GUARD, in fencing, implies a poſture proper to defend the body from the ſword of the antagoniſt.

GUARD-BOAT, in naval affairs, a boat commanded by a lieutenant, appointed to row around the ſhips in a harbour to ſee that the officers in each ſhip obſerve their watch, and call to the boat as ſhe paſſes, and do not ſuffer them to board without a watch-word.

GUARD-SHIP, a veſſel of war appointed to ſuperintend the marine affairs in a harbour or river, and ſee that the ſhips who are not commiſſioned have their proper watch kept duly every night, alſo to receive and ſecure ſeamen who are impreſſed in the time of war.

GUARDIAN, in law, a perſon who has the charge or cuſtody of ſuch perſon or perſons as have not ſufficient diſcretion to take care of themſelves; as ideots, or children under age.

GUAZUMA, baſtard cedar-tree, in botany, a genus of trees whoſe characters are as follow:

It hath a regular flower conſiſting of five leaves, which are hollowed like a ſpoon at their baſe; but at their tops are divided into two parts, like a fork; the flower cup conſiſts of three leaves, from whence ariſes the pointal, which afterwards becomes a roundiſh warted-fruit, which has five cells incloſing many ſeeds.

GUIDON, the name of a ſort of ſtandard carried by the king's life-guards; ſo called from its being broad at one extreme, and almoſt pointed at the other, and ſlit, or divided into two.

GUIDON alſo implies the officer who carries the guidon.

GUILANDINA, in botany, a genus of plants whoſe flower conſiſts of a campanulated cup, with five concave lanceolated petals. The ſtamina are ten ſubulated filaments, topped with obtuſe incumbent antheræ.

The fruit is a ventricoſe, compreſſed rhomboidal pod, having one cell, including oſſeous ſeeds of a globoſe compreſſed form.

GUILD, or GILD, a Saxon word ſignifying a company, or fraternity.

GUILDHALL, the chief hall of a city or corporation where the courts are held.

GUINEA-PEPPER, in botany. See the article CAPSICUM.

GUINEA-PIG, in zoology, a quadruped of the rat kind, with a variegated body, reſembling in ſome meaſure that of a young pig, whence the name.

GUITER, a muſical inſtrument of the ſtringed kind, uſed greatly in Spain, and at preſent in England.

GULA, in anatomy, the ſame with œſophagus. See OESOPHAGUS.

GULA, or GOLA, in architecture, the ſame with cymatium, or ogee. See CYMATIUM and OGEE.

GULES, in heraldry, the true ſcarlet colour, and expreſſed in engraving by lines falling perpendicular from the top of the eſcutcheon to the bottom.

GULPH, in geography, a part of the ſea almoſt ſurrounded by the land.

GUM, in pharmacy, a concreted vegetable juice, which tranſudes through the bark of certain trees, and hardens upon the ſurface.

GUM, among gardeners, a kind of gangrene incident to fruit-trees of the ſtone kind, ariſing from a corruption of the ſap, which, by its viſcidity, not being able to make its way through the fibres of the tree, is, by the protruſion of other juice, made to extravaſate and ouze out upon the bark.

When the diſtemper ſurrounds the branch, it admits of no remedy, but when only on one part of a bough, it ſhould be taken off to the quick, and ſome cow-dung clapped on the wound, covered over with a linen-cloth, and tied down. M. Quin-

tinie directs to cut off the morbid branch two or three inches below the part affected.

GUMS, *Gingivæ*, in anatomy; see GINGIVÆ.

GUM-BOILS, a morbid affection of the gums called by writers of surgery parulides. These are of different degrees, and usually arise from pains in the teeth. They are to be treated by discutients as other inflammatory tumors, but if these fail, or the disorder is neglected, it usually terminates in an abscess or fistula. Sage, camomile, and elder flowers, boiled in milk and water, make a good gargarism to be held in the mouth, and the remaining herbs may be sewed up in a bag to be kept hot to the cheek. A half roasted fig is a very good internal application, and, when the softness of the tumor shews that the matter is suppurated, it ought immediately to be opened with the lancet, to prevent the matter's lodging there, and eroding the bone, and producing a fistula or caries.

GUN, a fire-arm, or weapon of offence, which forcibly discharges a ball, shot, or other offensive matter, through a cylindrical barrel, by means of gun-powder. See the article GUN-POWER.

Gun is a general name, under which are included divers or even most species of fire-arms. They may be divided into great and small.

Great guns, called also by the general name cannons, make what we also call ordnance, or artillery; under which come the several sorts of cannons, as cannon-royal, demi-cannon, &c. Culverins, demi-culvers, sakers, minions, falcons, &c. See CANNON, CULVERIN, &c. as also ORDNANCE and ARTILLERY.

Small guns include musquets, musquetoons, carabines, blunderbusses, fowling-pieces, &c. See the article MUSQUET, &c.

Pistols and mortars are almost the only sort of regular weapons, charged with gun-powder, that are excepted from the denomination of guns. See the articles PISTOL and MORTAR.

GUN is also a name given by the miners to an instrument used in cleaving rocks with gun-powder. It is an iron cylinder of an inch and a quarter thick, and about six inches long, and having a flat side to receive the side of a wedge, and a hole drilled thro' it to communicate with the inside of the hole in the rock. The hole is made of about eight inches deep, and in the bottom of it are put about two or three ounces of gun-powder; then this gun is driven forcibly in, so as to fill up the hole, and the wedge is driven in on its flat side to secure it. The priming at the hole is then fired by a train, and, the orifice being so well stopped by this gun, the force of the powder is determined to the circumjacent parts of the rock which it splits.

GUNNEL, in ship-building, the upper-part of a ship's side.

GUNNER, an officer appointed for the service of the artillery; or a person skilled in the art of gunnery.

GUNNER *of a Ship of War*, an officer appointed to take charge of the artillery and ammunition abroad; and to teach the men the exercise of great guns.

GUNNERY, the art of determining the motion of bodies shot from mortars, cannon, &c. See the article PROJECTILE.

GUN-POWDER, a composition of salt-petre, sulphur, and charcoal, well mixed together and granulated; which easily takes fire, and expands with amazing force.

The invention of this composition is ascribed by Polydore Virgil to a chemist, who having accidentally put the ingredients above-mentioned into a mortar, and covered it over with a stone, it happened to take fire, and threw off the stone. Thevel says that this chemist was one Constantine Anelzen, a monk of Friburg; but Belleforet and others assert it to be Bertholdus Schwartz: at least it is affirmed that he first taught the use of gun-powder to the Venetians, in the year 1380. Peter Mexia however contradicts this account, by shewing it to have been used by Alponsus XI. king of Castile, in the year 1342. Ducange adds, that there is mention made of this powder in the registers of the chambers of accounts of France, so early as the year 1338; and our countryman, Friar Bacon, expressly mentions the composition, in his treatise *De nullitate Magiæ*, published at Oxford in the year 1216.

Method of making GUN-POWDER. The following receipe for making gun-powder is taken from Dr. Shaw's Chemical Lectures.

Take four ounces of refined salt-petre, an ounce of brimstone, and six drams of charcoal; reduce these to a fine powder, and continue beating them for some time in a stone-mortar, with a wooden-pestle, wetting the mixture between whiles with water, so as to form the whole into an uniform paste, which is reduced to grains, by passing it through a white sieve for the purpose; and in this form, being carefully dried, it becomes the common gun-powder.

For greater quantities, mills are usually provided, by means of which more work may be performed in one day than a man can do in a hundred. See MILL.

The nitre or salt-petre is refined thus: dissolve four pounds of rough nitre as it comes to us from the Indies, by boiling it in as much water as will commodiously suffice for that purpose; then let it shoot for two or three days in a covered vessel of earth, which sticks laid across for the crystals to adhere to. These crystals being taken out, are drained and dried in the open air.

In order to reduce this salt to powder, they dissolve a large quantity of it in as small a proportion of

of water as poſſible; then keep it conſtantly ſtirring over the fire, till the water exhales, and a white dry powder is left behind. See NITRE.

In order to purify the brimſtone employed, they diſſolve it with a very gentle heat; then ſcum and paſs it through a double ſtrainer. If the brimſtone ſhould happen to take fire in the melting, they have an iron cover that fits on cloſe to the melting veſſel, and damps the flame. The brimſtone is judged to be ſufficiently refined if it melts without yielding any fœtid odour between two hot iron-plates into a kind of red ſubſtance.

The coal for the making of gun-powder is either that of willow, or hazel, well charred in the uſual manner, and reduced to powder: and thus the ingredients are prepared for making this commodity; but as theſe ingredients require to be intimately mixed, and as there would be danger of their firing if beat in a dry form, the method is to keep them continually moiſt, either with water, urine, or a ſolution of ſal ammoniac: they continue thus ſtamping them together for twenty-four hours, after which the maſs is fit for corning and drying in the ſun, or otherwiſe, ſo as ſedulouſly to prevent its firing.

Different kinds of GUN-POWDER. The three ingredients of gun-powder are mixed in various proportions, according as the powder is intended for muſquets, great guns, or mortars; though theſe proportions ſeem not to be perfectly adjuſted, or ſettled by competent experience.

Semienowitz for mortars, directs 100 ℔ of ſalt-petre, 25 ℔ of ſulphur, and as many of charcoal; for great guns, 100 ℔ of ſalt-petre, 15 ℔ of ſulphur, and 18 ℔ of charcoal; for muſquets and piſtols 100 ℔ of ſalt-petre, 8 ℔ of ſulphur, and 10 ℔ of charcoal. Miethius extols the proportion of 1 ℔ of ſalt-petre to three ounces of charcoal, and two or two and a quarter of ſulphur; than which, he affirms, no gun-powder can poſſibly be ſtronger. He adds, that the uſual practice of making the gun-powder weaker for mortars than guns, is without any foundation, and renders the expence needleſsly much greater: for whereas to load a large mortar, 24 ℔ of common powder is required, and conſequently to load it ten times 240 ℔, he ſhews by calculation, that the ſame effect would be had by 150 ℔ of the ſtrong powder.

To increaſe the ſtrength of powder, Dr. Shaw thinks it proper to make the grains conſiderably large, and to have it well ſifted from the ſmall duſt. We ſee that gun-powder, reduced to duſt, has little explosive force; but when the grains are large, the flame of one grain has a ready paſſage to another, ſo that the whole parcel may thus take fire nearly at the ſame time, otherwiſe much force may be loſt, or many of the grains go away as ſhot unfired.

Method of trying and examining GUN-POWDER. There are two general methods of examining gun-powder; one with regard to purity, the other with regard to its ſtrength. Its purity is known by laying two or three little heaps near each other upon white paper, and firing one of them; for if this takes fire readily, and the ſmoke riſes upright, without leaving any droſs, or feculent matter behind, and without burning the paper, or firing the other heaps; it is eſteemed a ſign that the ſulphur and nitre were well purified, that the coal was good, and that the three ingredients were thoroughly incorporated together; but if the other heaps alſo take fire at the ſame time, it is preſumed that either common ſalt was mixed with the nitre, or that the coal was not well ground, or the whole maſs not well beat, and mixed together; and if either the nitre or ſulphur be not well purified, the paper will be black or ſpotted.

In order to try the ſtrength of gun-powder, there are two kinds of inſtruments in uſe; but neither of them appear more exact than the common method of trying to what diſtance a certain weight of powder will throw a ball from a muſket.

There has been much talk of a white powder, which, if it anſwered the character given it, might be a dangerous compoſition: for they pretend that this white powder will throw a ball as far as the black, yet without making a report; but none of the white powder we have ſeen, ſays Dr. Shaw, anſwers to this character; being, as we apprehend, commonly made either with touchwood or camphor, inſtead of coal.

Obſervations on the Force of GUN-POWDER. Gun-powder fired either in vacuum, or in air, produces by its exploſion a permanent elaſtic fluid: for if a red-hot iron be included in a receiver, after being exhauſted, and gun-powder be let fall on the iron, the powder will take fire, and the mercurial gage will ſuddenly deſcend upon the exploſion; and though it immediately aſcends again, yet it will never riſe to the height it firſt ſtood at, but will continue depreſſed by a ſpace proportioned to the quantity of gun-powder which was let fall on the iron.

The ſame production likewiſe takes place, when gun-powder is fired in the air: for if a ſmall quantity of powder be placed in the upper-part of a glaſs tube, and the lower part of the tube be immerged in water, and the water be made to riſe ſo near the top, that only a ſmall portion of air is left in that part where the gun-powder is placed: if in this ſituation the communication of the upper-part of the tube with the external air be cloſed, and the powder be fired, which will eaſily be done by a burning glaſs, the water will in this experiment deſcend upon the exploſion, as the quickſilver did in the laſt; and will always continue depreſſed below the place at which it ſtood before the exploſion; and the quantity of this depreſſion will be greater, if the quantity

quantity of powder be increaſed, or the diameter of the tube be diminiſhed. From whence it is proved, that as well in air as in a vacuum, the exploſion of fired powder produces a permanent elaſtic fluid. It alſo appears from experiment, that the elaſticity or preſſure of the fluid produced by the firing of gun-powder, is, *cæteris paribus*, directly as its denſity. This follows from hence, that if in the ſame receiver a double quantity of powder be let fall, the mercury will ſubſide twice as much as in the firing of a ſingle quantity.

To determine the elaſticity and quantity of this elaſtic fluid, produced from the exploſion of a given quantity of gun-powder, Mr. Robins premiſes, that the elaſticity of this fluid increaſes by heat, and diminiſhes by cold in the ſame manner as that of the air; and that the denſity of this fluid, and conſequently its weight, is the ſame with the weight of an equal bulk of air having the ſame elaſticity, and the ſame temperature. From theſe principles, and from his experiments (for a detail of which, we muſt refer the reader to his New Principles of Gunnery, in Scholium to Prop. II.) he concludes, that the fluid produced by the firing of gun-powder will be $\frac{3}{10}$ of the weight of the gun-powder, and the ratio of the reſpective bulks of the powder, and the fluid produced from it, will be in round numbers 1 to 244.

Hence we are certain, that any quantity of powder, fired in any confined ſpace, which it adequately fills, exerts, at the inſtant of its exploſion, againſt the ſides of the veſſel containing it, and the bodies it impels before it, a force, at leaſt 244 times greater than the elaſticity of common air; or, which is the ſame thing, than the preſſure of the atmoſphere; and this without conſidering the great addition which this force will receive from the violent degree of heat with which it is endued at that time, the quantity of which augmentation is the next head of Mr. Robins's enquiry. He determines that the elaſticity of the air is augmented when heated to the extremeſt heat of red hot iron, in the proportion of 796 to 194$\frac{1}{2}$, and ſuppoſing that the flame of fired gun-powder is not leſs hot than red hot iron, and the elaſticity of the air, and conſequently of the fluid, generated by the exploſion, being augmented by the extremity of this heat in the ratio of 796 to 194$\frac{1}{2}$, it follows, that if 244 be augmented in the ratio, the reſulting number, which is 999$\frac{1}{2}$, will determine how many times the elaſticity of the flame of fired powder, exceeds the elaſticity of common air, ſuppoſing it to be confined in the ſame ſpace which the powder filled before it was fired.

Hence, then, the abſolute quantity of the preſſure exerted by gun powder, at the moment of its exploſion, may be aſſigned: for, ſince the fluid then generated has an elaſticity of 999$\frac{1}{2}$, or, in round numbers, 1000 times greater than common air; and ſince common air, by its elaſticity, exerts a preſſure on any given ſurface, equal to the weight of the incumbent atmoſphere, with which it is in equilibrio, the preſſure exerted by fired powder, before it has dilated itſelf, is 1000 times greater than the preſſure of the atmoſphere; and conſequently the quantity of this force on a ſurface of an inch ſquare, amounts to above ſix ton weight, which force, however, diminiſhes as the fluid dilates itſelf. The variations of the denſity of the atmoſphere does not any way alter the action of powder by any experiment that can be made. But the moiſture of the air has a very great influence on the force of it; for that quantity which, in a dry ſeaſon, would communicate to a bullet a velocity of 1700 feet in one ſecond, will not, in damp weather, communicate a velocity of more than 12 or 1300 feet in a ſecond, or even leſs, if the powder be bad and negligently kept.

The velocity of expanſion of the flame of gun-powder when fired in a piece of artillery, without either bullet, or any other body before it, is prodigious. By the experiments of Mr. Robins, it ſeems this velocity cannot be much leſs than 7000 feet in a ſecond. This, however, muſt be underſtood of the moſt active part of the flame: for, as was before obſerved, as the elaſtic fluid in which the activity of gun-powder conſiſts, is only $\frac{3}{10}$ of the ſubſtance of the powder, the remaining $\frac{7}{10}$ will in the exploſion be mixed with the elaſtic part, and will by its weight retard the activity of the exploſion; and yet they will be ſo compleatly united as to move with uncommon motion; but the unelaſtic part will be leſs accelerated than the reſt, and ſome of it will not even be carried out of the barrel, as appears by the conſiderable quantity of unctuous matter which adheres to the inſide of all fire-arms, after they have been uſed. Theſe inequalities in the expanſive motion of the flame render it impracticable to determine its velocity, otherwiſe than from experiments.

To recover damaged GUN-POWDER. The method of the powder-merchants is this; they put part of the powder on a ſail-cloth, to which they add an equal weight of what is really good, and with a ſhovel mingle it well together, dry it in the ſun, and barrel it up, keeping it in a dry and proper place. Others again, if it be very bad, reſtore it by moiſtening it with vinegar, water, urine, or brandy: then they beat it fine, ſearce it, and to every pound of powder add an ounce, an ounce and a half, or two ounces, according as it is decayed, of melted ſalt-petre. Afterwards, theſe ingredients are to be moiſtened and mixed well, ſo that nothing can be diſcerned in the compoſition, which may be known by cutting the maſs; and then they granulate it as aforeſaid. In caſe the powder be in a manner quite ſpoiled, the only way is to extract the

the ſalt-petre with water, according to the uſual manner, by boiling, filtrating, evaporating, and cryſtallizing; and then with freſh ſulphur and charcoal to make it up a-new again. In regard to the medical virtues of gun-powder, Boerhaave informs us, that the flame of it affords a very healthy fume in the height of the plague, becauſe the explosive acid vapour of nitre and ſulphur corrects the air; and that the ſame vapour, if received in a ſmall cloſe pent-up place, kills inſects.

GUN-SHOT-WOUNDS, thoſe made by ſhot, bullets, &c. ſhot from ſome ſpecies of fire-arms.

GUNTER's-LINE, called alſo the *Line of Numbers*, and the *Line of Lines*, is a graduated line uſually placed upon ſcales, ſectors, &c. ſo called from Edmund Gunter, its inventor.

This line is no other than a logarithmic ſcale of proportionals, wherein the diſtance between each diviſion is equal to the number of mean proportionals contained between the two terms, in ſuch parts as the diſtance between 1 and 10 is 10000, &c. Wherefore,

If the diſtance betwixt 1 and 10 upon the ſcale be made equal to 10000, &c. equal parts, and .954 &c. the logarithm of 9 of the ſame parts, be ſet off from 1 to 9, it will give the diviſion ſtanding againſt the number 9. In like manner, if .903, .845, .778, which are the logarithms of 8, 7, and 6, of the ſame equal parts, be ſet off from 1 to 8, 7, and 6, they will give the diviſions anſwering to the numbers 8, 7, and 6, upon the line. And after the ſame manner may the whole line be divided.

This line has been contrived various ways, for the advantage of having it as long as poſſible. It was firſt placed, by its inventor Edmund Gunter, on a two feet ſcale. After this, Wingate doubled the line, in order to render it ſuſceptible of working right on or a-croſs. Then, the learned Oughtred projected it in a circle, and alſo made it to ſlide: and, laſtly, it was projected in a kind of ſpiral, by Brown.

But the method of uſing or applying it in all is not very different. In Gunter's and Wingate's projection, common compaſſes are uſed; in Oughtred's and Brown's, flat compaſſes, or an opening index; and in the ſliding rule no compaſſes at all, the ſlider ſupplying the place of the compaſſes.

Deſcription of GUNTER's *Line.* This line is uſually divided into an hundred parts, every tenth whereof is numbered, beginning with 1, and ending with 10. So that, if the firſt-great diviſion 1 repreſent one tenth of any integer or whole number, the next 2 will repreſent 2 tenths; 3, three tenths, &c. and the intermediate diviſions ſo many 100th parts of the ſame integer. Or, if theſe ſubdiviſions repreſent 10 integers, then each of the larger diviſions will repreſent 100, and the whole line will be 1000. In like manner, it may be extended to 10000 by making each ſubdiviſion 100. Hence, it is eaſy to conceive, that any number whatſoever may be found upon the rule, by increaſing or decreaſing the large diviſions, and, conſequently, this ſingle line will repreſent the whole table of logarithms.

Uſe of GUNTER's *Line.*—1. One number being given to be multiplied by another, to find their product.

Suppoſe the numbers given were 8 and 4, to find their product. Extend the compaſſes from 1 to 4, and that extent laid from 8, the ſame way, will reach to 32, the product required. Or, if you work by the ſliding-rule, ſet 1, at the beginning of the ſliding-piece, againſt 4 on the upper or fixed piece; and againſt 4 on the ſlider ſtands 32, on the upper or fixed piece; which is the product required. Whence it is abundantly evident, that the ſliding-piece performs the office of the compaſſes, and therefore, when the method of ſolving any problem by the compaſſes is underſtood, there will be no difficulty of ſolving the ſame by the ſliding-rule.

2. One number being given to be divided by another, to find the quotient.—Suppoſe it were required to divide 64 by 4. Extend the compaſſes from 4 to 1, and the ſame extent, laid the ſame way, will reach from 64 to 16, the quotient required.

3. Three numbers being given to find a fourth in direct proportion.—Let the numbers given be 7, 22, and 14. Extend the compaſſes from 7 to 22, which extent, laid the ſame way, will reach from 14 to 44, the fourth proportional required.

4. To find a mean proportional between 2 given numbers.—Biſſect the diſtance between the two given numbers, and the point of biſſection will fall on the proportional ſought. Thus, if the numbers given be 32 and 8, the middle point between them will be 16, which is the mean proportional required.

5. To extract the ſquare root of any number.—Biſſect the diſtance between 1 on the line, and the point repreſenting the given number; the half whereof being laid from one will give the root required. Thus the ſquare root of 9 will be found to be 3, of 81, 9, &c. The reaſon of theſe operations will be eaſily conceived, by conſidering the nature of logarithms; for, as we have already obſerved, this line is no other than a projection of the table of logarithms, and, conſequently, whatever is ſaid of the latter may juſtly be applied to the former. See LOGARITHMS.

GUNTER's-QUADRANT, one made of wood, braſs, &c. containing a kind of ſtereographic projection of the ſphere on the plane of the equinoctial, the eye being ſuppoſed placed in one of the poles.

Beſides the uſe of this quadrant in finding heights and diſtances, it ſerves alſo to find the hour of the day, the ſun's azimuth, and other problems of the globe. See the article *Gunter's* QUADRANT.

GUNTER'S SCALE, called by navigators ſimply the Gunter, is a large ſcale, generally two feet long, and about an inch and a half broad, with artificial lines delineated on it, of great uſe in ſolving queſtions in trigonometry, navigation, &c.

The line of numbers on theſe ſcales conſiſts of two equal lengths, commonly called two radii; the firſt containing the logarithms of numbers from 10 to 100; and in the ſecond are inſerted thoſe between 100 and 1000, or ſuch of them as can conveniently be introduced.

Theſe diviſions are taken from a ſcale of equal parts; ſuch, that 100 make the length of one radius; and from this ſcale the diviſions for the ſines, tangents, and verſed ſines, are alſo taken. Now, from this conſtruction of the line of numbers, it is plain, that, as the numbers in one radius exceed thoſe in the other, by one place in the ſcale of numeration, therefore the differences of their indices muſt alſo be unity: ſo that ſuch numbers only, whoſe index differs by 1, can be eſtimated in a length of two radii; but in a length of three radii, numbers, whoſe indices differ by 2, may be read; and a difference of 3 may be reckoned in a length of 4 radii, &c. The tables of logarithmic ſines, tangents, ſecants, and verſed ſines, are generally computed for a circle, whoſe radius is 10,000,000: therefore,

In the ſines, the index 9 belongs to all between	90	0	0 and	5	44	36	
The index 8	5	44	36 and	0	34	23	
The index 7 to all bet.	0	34	23 and	0	3	27	
6	0	3	27 and	0	0	21	&c.

In the tangents, the index 9 belongs to all between	45	0	and	5	42	10	

And the indices, 8, 7, 6, &c. fall as in the ſines.

In the verſed ſines, the index 10 belongs to all between	180	0	and	90	0		
9 belongs to all between	90	0	and	25	51		
8	25	51	and	8	7		
7	8	7	and	2	34		
6	2	4	and	0	45	&c.	

Now, as the length of the Gunter's ſcale admits of no more than two radii, or of ſuch numbers only, whoſe index differs by unity; therefore, within this length, no more of the ſines, tangents, or verſed ſines, can be introduced, than thoſe whoſe index differs by unity: and as not only the greateſt number among the ſines and tangents, but alſo thoſe more generally wanted, have the indices 9 and 8 differing by unity; therefore all the ſines from 90° to 0° 34′, and all the tangents from 45° to 0° 34′, are thoſe only, which are put on theſe ſcales; the diviſions anſwering to the leſſer ſines and tangents being omitted for want of room. And this is the reaſon why the ſine of 90°, and the tangent of 45°, are limited by the ſame termination as the ſecond radius on the line of numbers.

To conſtruct the Line of logarithmic Sines on GUNTER'S *Scale.*—From the ſcale of equal parts, take the numbers expreſſing the arithmetical complements of the log-ſines of the ſucceſſive degrees, and parts of degrees intended to be put on the ſcale, deſcending orderly from 90°; then theſe diſtances, ſucceſſively laid from the mark repreſenting 90° at the right-hand end of the ſcale, will give the ſeveral diviſions of a ſcale of logarithmic ſines.

For the ends of any ſcale being aſſigned, the progreſſive diviſions of that ſcale are laid thereon from that end which repreſents the beginning of the progreſſion; or the ſame diviſions may be laid from the other end, by taking the complements of the terms to the whole length of the ſcale.

Conſequently the arithmetical complements of the ſines are to be laid from the diviſion repreſenting 90 degrees.

To conſtruct the Line of logarithmic Tangents on GUNTER'S *Scale.*—Theſe are laid down in the ſame manner, and for the ſame reaſons, that the ſines were; the tangent of 45° ſtanding againſt the ſine of 90°.

The diviſions for the tangents above 45° are reckoned on the ſame line from 45° towards the left-hand; or any tangent and its co-tangent are expreſſed by the ſame diviſion.

Thus one mark ſerves for 40° and 50°, and the diviſion at 30° ſerves alſo for 60°; that at 20° ſerves for 70°, &c. and the like is to be underſtood for the intermediate diviſions.

For as the tangent of an arc is to a radius;
So is radius to the co-tangent of that arc.

Therefore the tangent is equal to the ſquare of radius divided by the co-tangent.

And the co-tangent is equal to the ſquare of radius divided by the tangent.

Now, the radius being unity, its ſquare is alſo unity.

Therefore the tangent and co-tangent of any arc are the reciprocals one of the other.

But the reciprocals of numbers are correlatives to the arithmetical complements of their logarithms.

Therefore the logarithms of a tangent and its co-tangent are arithmetical complements one of the other, and conſequently will fall at equal diſtances from 45 degrees.

Therefore, in the line of logarithmic tangents, the diviſions to degrees under 45 ſerve alſo for thoſe above, both being equally diſtant from 45 degrees.

To construct the Line of logarithmic versed Sines on GUNTER's *Scale.*—As the greatest number of degrees will fall within the limits of the scale by beginning at 18°, therefore the termination of this line is at 18°, which is put against 90° on the sines: and although the numbers annexed to the divisions increase in the order from right to left, yet they are only the supplements of the versed sines themselves.

Now subtract the logarithmic versed sines of such degrees and parts of degrees as are intended to be put on the scale, from the logarithm versed sine of 180°; then the remainder taken from the aforesaid scale of equal parts, and laid successively from the termination of this line, will give the several divisions sought.

The following Table to every 10 degrees was constructed in the foregoing manner, and are the numbers to be taken from the scale of equal parts, for the degrees they stand against.

Deg.	Supplements of VersedSines.	Deg.	Supplements of VersedSines.	Deg.	Supplements of VersedSines.
180	0,00000	120	0,12494	60	0,60206
170	0,00331	110	0,17327	50	0,74810
160	0,01330	100	0,23149	40	0,93190
150	0,03011	90	0,30103	30	1,17401
140	0,05402	80	0,38387	20	1,52066
130	0,08545	70	0,48282	10	2,21941

From this table it appears, that the least versed sine which can be introduced within the length of a double radius, falls between 10° and 20°, where the index changes from 1 to 2; which will happen about 11° 28′.

If a table of logarithm versed sines to 180° are wanting, they are easily made by the following rule:

"Take the logarithm sine of 30 degrees from twice the logarithm sine of (N) any number of degrees, the remainder is the logarithm versed sine of (2 N, or) twice those degrees."

For it is a well known geometrical property, that the sine of any arc (A) is a mean proportional between radius (R) and half the versed sine of twice that arc.

Therefore, putting v for the versed sine, and s for the sine;

The $v\,2\,A = \left(\frac{2\,s\,s\,A}{R} = s\,s\,A \times - \frac{2}{R} = s\,s\,A \times \frac{2}{10} =\right) s\,s\,A \times \frac{1}{5}$; radius being 10.

Or the log. $v\,2\,A = 2$ log. $s\,A$ — log. 5.

But, when radius is 10, the sine of 30° is 5.

Therefore the log. $v\,2\,A = 2$ log. $s\,A$ — log. sine of 30°.

Most of the writers on this subject give the following rule for laying down the divisions of this line:

"From the line of logarithmic sines, take the distance between 90° and any arc; that distance being twice repeated, from the termination of the line of versed sines, will give the division for twice the complement of that arc."

Thus the distance between 90° and 20° on the sines twice repeated, gives the versed sine of 140°; or twice 70°, the complement of 20°. For the divisions to be laid on this line, are the differences between the logarithm versed sine of 180°, and the logarithm versed sines of the successive arcs.

Now the difference between the logarithm versed sines of 180°, and of any arc 2 A, is log. ver. sine 180 — 2 log. sin. A + log. sin. of 30°.

Or, 10,30103 + 9,69897 — twice the log. sin. of A.

Or, 20,00000 — twice logarithm sine of A.

Or the arithmetical complement of twice log. sine of A.

That is, the difference between the logarithm versed sine of 180°, and the logarithm versed sine of any arc, is equal to double the arithmetical complement of the logarithm sine of half that arc, rejecting the indices.

But as the differences give the divisions to the supplements of the real versed sines, therefore the arithmetical complement of the logarithm sine of any arc, being doubled, will give the distance of the division for the supplement of twice that arc on the line of versed sines.

Thus, for 70°, the logarithm sine is 9,97299.

The arithmetical complement is 0,02701.

Its double is 0,05402.

Which is the number in the foregoing table standing against 140°, and is the supplement versed sine of twice 70°.

Now, as the arithmetical complement of the log. sines of arcs are the distances on the line of sines between 90°, and the divisions to those arcs; therefore the distances between 90 degrees and any arc, being twice repeated, will give the division of the supplemental versed sine to twice the co-sine of that arc. *Phil. Trans.* Vol. XLIX.

GURNARD, in ichthyology, the English name of two species of trigla.

These fishes, from their different colours, are called the grey and red gurnard. The grey gurnard has a bifid and spinose snout, with two spines at each eye. The red kind has likewise the rostrum bifid, and the covering of the gills striated, and each of them armed with three spines. This last is a very remarkable spinose fish, which seldom exceeds a foot in length.

Both these fishes make a singular noise, when out of the water, not unlike the grunting of a hog; whence their English name.

GUSSET, in heraldry, is formed by a line drawn

drawn from the dexter or ſiniſter chief points, and falling down perpendicularly to the extreme baſe.

GUTTÆ, in architecture, are ornaments in form of little cones, in the platform of the Doric corniche, or architrave, underneath the triglyphs, repreſenting a ſort of drops or bells, uſually ſix in number. They are ſometimes called lachrymæ, campanæ, or campanulæ.

GUTTÆ *Roſacea*, in medicine, denotes a red or pimpled face; a diſtemper which, though not always owing its original to hard drinking, is nevertheleſs moſt incident to tipplers of ſtrong beer, wines, ſpirits, &c.

As to the cure, beſides making a revulſion by bleeding, bliſtering, cupping, iſſues, &c. the diet ought to be moiſtening and cooling, as lettuce, purſlain, ſorrel, and ſpinach: the drink may be an emulſion of the cold ſeeds, milk and water, clarified whey, &c.

GUTTÆ *Serena*, barbarouſly ſo called by the Latin writers of the lower ages, which the Greeks term αμαρωσις, in medicine, is a total blindneſs in the principal parts of the immediate organ of viſion, the eye ſtill continuing clear and ſeemingly unaffected.

GUTTERS, in architecture, a kind of canals in the roofs of houſes, ſerving to receive and carry off the rain.

Gutters, with reſpect to their poſition, are of two kinds: ſuch as come ſomething near a parallelism with the horizon; and ſuch as incline towards a vertical poſition to the horizon.

GUTTURAL, a term applied to letters or ſounds pronounced or formed as it were in the throat. There are four guttural letters in the Hebrew, viz. אהחע, which, for memory's ſake, are termed ahachah. See LETTER.

GUTTY, *Gutté*, in heraldry, a term uſed when any thing is changed or ſprinkled with drops.

In blazoning, the colour of the drops is to be named, as gutty of ſable, of gules, &c.

GUY, in naval affairs, a rope uſed to keep ſteady any weighty body which is hoiſted into, or lowered out of, a ſhip, or to prevent any thing from being ſhaken at ſea by the agitation of the ſhip on the waves.

GUZES, in heraldry, roundles of a ſanguine or murry colour. Theſe, from their bloody hue, are ſuppoſed to repreſent wounds.

GYMNASIARCH, *Gymnaſiarcha*, in antiquity, the maſter of a gymnaſium or place of exerciſe.

The word is Greek, γυμνασιαρχης, and derived from γυμνασιον, a place of exerciſe, and αρχων, a head or maſter.

This office was of great importance, as all the youth were truſted to this maſter's care to be formed to exerciſes of the body. He had three officers under him: the xyſtarch, who was maſter of the athletæ or wreſtlers: the gymnaſtra, who had the direction of all the other exerciſes; as that they ſhould be performed in due time and properly; that the youth attempted nothing beyond their ſtrength, or injurious to their health: and the pædotriba, who taught the exerciſes mechanically, without underſtanding their theory.

Under theſe were ſeveral ſubalterns or ſervants for the inſtruction of the youth.

GYMNASIUM, the place where the above exerciſes were performed, being a public edifice, under proper maſters.

The word is Greek, γυμνασιον, and is derived from γυμνος, naked, as they put off their cloaths, the better to perform their exerciſes.

GYMNASTICS, the art of performing the ſeveral bodily exerciſes, as wreſtling, running, fencing, dancing, &c. See the article WRESTLING, &c.

The part of medicine which regulates the exerciſes of the body, whether for preſerving or reſtoring health, is alſo termed gymnaſtic.

GYMNOSOPHISTS, a ſect of philoſophers who cloathed themſelves no farther than modeſty required. There were ſome of theſe ſages in Africa; but the moſt celebrated clan of them was in India. The African gymnoſophiſts dwelt upon a mountain in Ethiopia, near the Nile, without the accommodation either of houſe or cell. They did not form themſelves into ſocieties like thoſe of India, but each had his private retirement, where he ſtudied and performed his devotions by himſelf. If any perſon had killed another by chance, he applied to theſe ſages for abſolution, and ſubmitted to whatever penances they enjoined. They obſerved an extraordinary frugality, and lived only upon the fruits of the earth. Lucan aſcribes to theſe gymnoſophiſts ſeveral new diſcoveries in aſtronomy.

GYMNOSPERMIA, an order or diviſion of the didynamia claſs of plants in the Linnæan ſyſtem of botany, comprehending all thoſe plants of that claſs whoſe flowers are deſtitute of a pericarpium or capſule; the ſeeds being lodged in the baſe of the cup. The plants of this order are ſcented, and are accounted cephalic and reſolvent, the virtue being principally contained in the leaves; it includes thoſe plants with labiated flowers, ſuch as mint, thyme, betony, &c.

GYNÆCEUM, among the ancients, the apartment of the women, a ſeparate room in the inner part of the houſe, where they employed themſelves in ſpinning, weaving, and needle-work.

GYNANDRIA, from γυνη, female, and ανηρ, male, the name of the twentieth claſs of plants in the Linnæan ſyſtem of botany, comprehending all thoſe whoſe ſtamina grow either on the piſtillum or upon a receptacle elongated into the form of a ſtyle, and carrying on it both the ſtamina and piſtil. All the flowers of this claſs have a monſtrous appearance, owing to the uncommon ſituation of the parts of fructification,